COTTON

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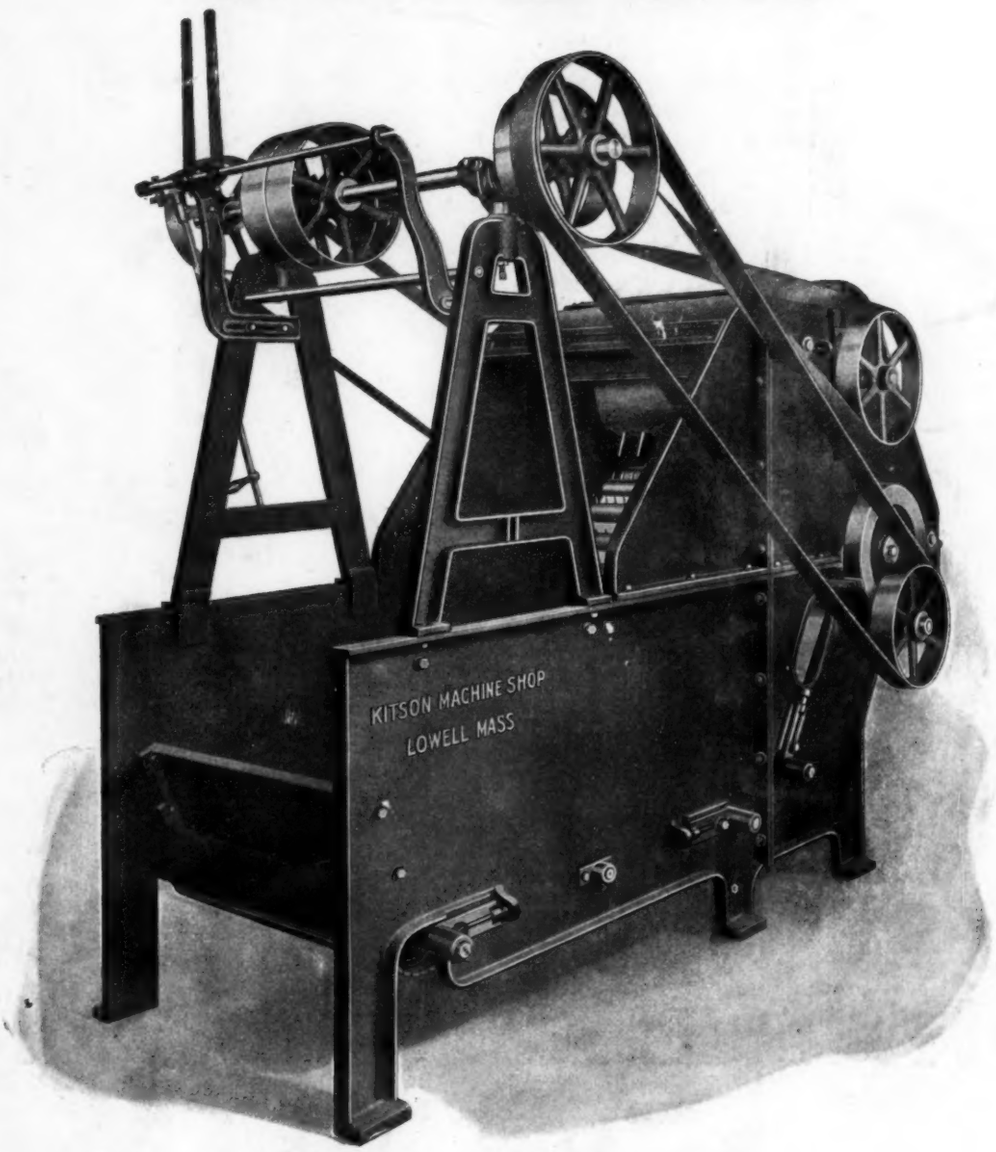

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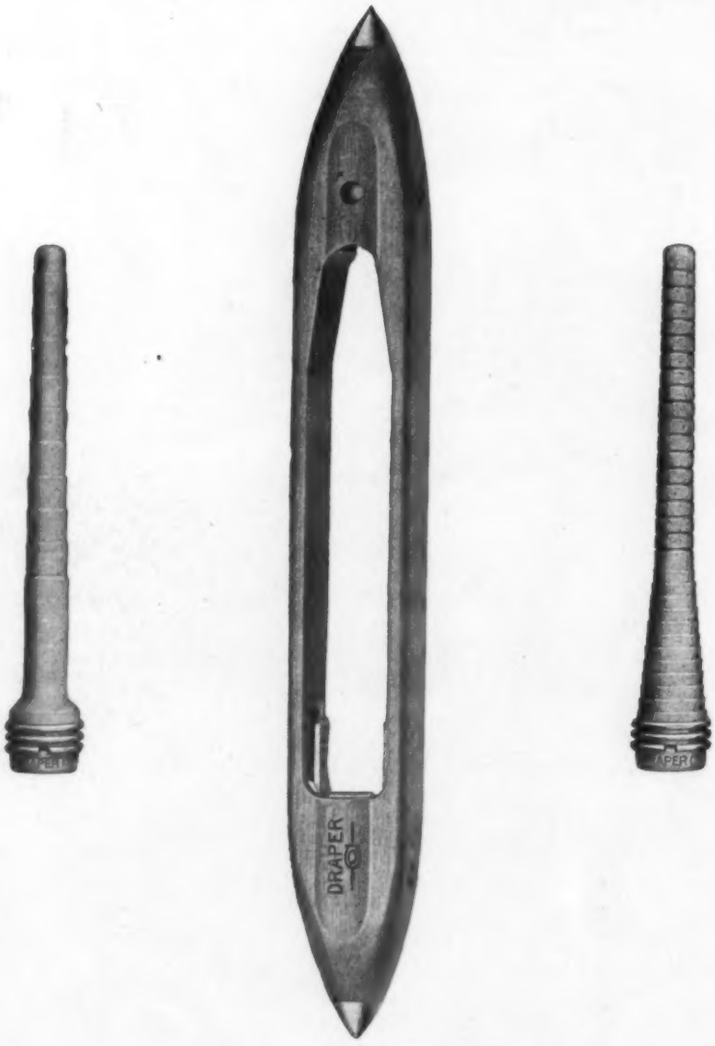

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MORE WAREHOUSES FOR COTTON.

In a recent issue of the *Columbia State,* the statement is made that "the one outstanding defendable reason for a bill such as that now before the General Assembly (of South Carolina), to create and operate a state warehouse system for storing cotton, is the necessity for protecting the great wealth-producing industry of the South from the perils and disasters incident to the precipitate marketing of millions of bales of renters and croppers and other financially weak and unorganized producers of cotton."

Isn't this a sufficient reason? Under the present system of marketing cotton, it is practically impossible for the class of people whom the *State* classifies as "renters and croppers and other financially weak and unorganized producers," to procure satisfactory loans on their cotton while that cotton still remains in their hands as owners. In securing the photographs for the leading article of the present issue, the opinions of many cotton planters were obtained concerning this subject. One prominent planter made this statement as he pointed to the bales of cotton resting on the ground in the front yard of a small house in his section. He said, "There is the kind of man that your sprinkled warehouses will protect. There is the man who, under present conditions cannot realize on his cotton unless he takes his cotton to market and sells it for whatever it may bring. He cannot go to a bank and borrow money on that cotton as it stands, as the majority of banks require something more tangible than cotton in the open to finance a loan. A man who is a large real estate holder may borrow money on cotton, because he has land values behind him to protect the bank making the loan in case the man himself were irresponsible." Later in discussing this situation with the owner of these few bales, which were at the time being photographed, he also expressed a desire to see the warehouse plan go through whereby he might put his cotton in a warehouse where it could be protected from fire at a reasonable rate and where he could obtain loans on the warehouse receipts without having other security.

This does not necessarily call for State owned warehouses. Warehouses owned by private corporations, or by local planters, merchants, brokers, and others on the community of interest plan, would be equally adaptable and probably more satisfactory in the end. However, as Lewis W. Parker stated in the January issue of Cotton, "If there must be an alternative between the construction of warehouses by the state or no warehouses constructed, it would seem to be to the best interests of the whole community that such warehouses should be constructed by the state, which would thus guarantee to the producer the safe guarding of his product."

The ultimate end of this whole discussion rests in one sentence. *The South needs more warehouses.* Those warehouses should be built at every point where the cotton producing interests of the surrounding territory calls for such a warehouse. Furthermore, in every case where a warehouse is newly constructed and in every other case where

the present warehouses are not equipped with an automatic fire protection system, they should be so equipped.

While, under the present conditions, the average insurance charge to the farmer on cotton stored in warehouses not equipped with fire protection apparatus, is approximately 15 cents per bale per month, this same warehouse when thoroughly protected with an automatic fire protective system, would cut that rate a varying amount, according to the location of the warehouse and other local conditions, to approximately ½ cent a bale per month. This difference is a large one and should be thoroughly considered in building new warehouses in any section of the cotton belt.

We wish to call special attention to the series of articles in this issue on the warehouse question, inasmuch as these articles deal with the vital and efficient facts necessary for the proper protection of the South's great cotton crop and for the South's immense number of cotton growers and cotton users. Particularly we wish to call attention to the series of photographs which illustrate the first of these articles as showing the actual conditions as they are to be found in the different sections.

The South needs better baling, warehousing and handling faciilties for its great cotton crop. The producers desire it; the merchants desire it; and the cotton manufacturers desire it. It is something that must come in time. The sooner that time arrives, the sooner will the South be able to retain a larger percentage of the money value derived from its valuable cotton crop, not only from the lossage occurring from poor handling, but also by the equalization of the cotton prices because of the better warehouse facilities furnished and by the ability of the less prosperous producers to thereby hold their cotton until such time as a reasonable market price shall be afforded. Every daily newspaper in the South; every weekly and monthly paper in the South; every merchant and banker in the South; and every legislator and planter in the South should lend their aid and strive to their utmost to bring to an early and successful conclusion these most necessary adjuncts to the South's greatest commercial crop.

"BENIGN PROTECTION."

The following editorial is from the *American Economist* of February 9th.

"The publication by COTTON, an influential magazine issued in Atlanta, of a strong protection article by Fred W. Simons, of Philadelphia, is an event of more than ordinary interest. It is notable and significant that a magazine located in the busiest city in the South should give so liberal portion of its space to an exposition of the protective policy that is calculated to augment the fast growing sentiment in favor of protection that is exhibited in many parts of the South. Also it is highly creditable to COTTON that it should open its pages to fair and free discussion of a question that is daily and hourly gaining attention among this magazine's readers and patrons. Time was when pro-protection articles were in Southern journalism 'scarce as hens' teeth.' That time seems to have passed forever. Now the people of the South, educated in a practical way by the great industrial prosperity that has come to them through protection, are coming to believe that there is much of merit in the doctrine of protection. This is not saying that there are fewer people in the South who always vote the Democratic ticket, but it is undoubtedly true that the number of Southern business men who have accepted protection as sound and sensible has greatly increased and still is increasing. This means that more Protectionist Democrats will be elected to Congress from Southern states.

"We reprint in full the article in COTTON for January, entitled 'Benign Protection.' The writer, Mr. Simons, formerly president of the National Association of Hosiery and Underwear Manufacturers, shows himself to be thoroughly capable of dealing adequately with his subject. With respect to fair and candid statement, good logic and well enforced conclusions his presentment is exceptionally strong. Not many business men have made a deeper study of the economic principle of a Tariff for protection, as contrasted with a Tariff for revenue, or are able to present the subjecct in words better chosen. Mr. Simons in 'Benign Protection' will be found to be extremely well worth reading."

In this connection it may be of interest to note that Mr. Simon's second paper on "Benign Protection" will appear in the April issue of COTTON.

KNOCKING SOUTHERN MILLS.

In a recent report issued by the bureau of labor at Washington the living conditions of the Southern mill operatives are sharply criticised. The person who prepared the report took the position that because he personally did not like their dinner menu, that necessarily it was "so low that one would expect few families to live on it."

This is hardly a fair position to take, as the average Southern born citizen would consider himself very badly used if forced to forego his hot biscuits for the cold white bread and his "corn pone" or muffins for the far famed, but gummy brown bread of Boston. He prefers his salt pork and greens or cabbage to the salt beef and kale or cabbage of other sections. He has not as yet become accustomed to the succulent salt cod fish of the swell society of some states.

If some of the statements in this report were the idle vaporings of Hayward and Ettor; if they had emanated from that Lawrence hotbed of socialistic endeavor; they would be considered wholly in keeping with the balance of their red flag propogandism and no one would have been surprised. Under the present conditions it would seem that either a revised report or an expurgated edition is in order.

As a matter of plain fact, the Southern mill operatives are happy and contented. They are being used well and they know it. Why not let them alone!

The officers and board of governors of the American Cotton Manufacturers' Association request the attendance of every cotton manufacurer at the sixteenth annual convention of the Association. This well be held at the Raleigh Hotel, Washington, D. C., on April 2, 3 and 4, 1912.

If not already a member you should be. Your business demands it.

Following this convention will be the fourth annual convention of the Southern Commercial Congress at Nashville, Tenn., on April 8th, 9th and 10th. All manufacturers in a position to do so should also attend this convention. Every movement of this nature, tending to broaden the South should receive the hearty support of the cotton manufacturer. Such movements always have a favorable reaction on the business of the section to which they refer and deserve to receive the unqualified support of every citizen living in that section.

WHY THE SOUTH NEEDS WAREHOUSES.

Careless Methods of Handling the Cotton Crop Causes an Annual Loss of Over Fifty Million Dollars. Co-operation Between Growers, Merchants, Bankers and Manufacturers Necessary to Secure Immediate Results.

(Contributed Exclusively to COTTON.)

BY HARVIE JORDAN, ATLANTA, GA., EX-PRESIDENT COTTON GROWERS' ASSOCIATION.

If a cotton manufacturer should bale his goods, throw them out in the weather until sold, and then deliver them to the merchant—with the covering of the bales torn into shreds and the goods partially rotted and damaged, how many additional orders would that manufacturer receive?

If the Western grain producers should sack their wheat or corn, and bale their hay, then throw these products out into the weather until they were badly damaged with mud and excess moisture, what kind of treatment would these farmers receive when they delivered such unmerchantable wares at the large grain elevators?

If the fruit and truck growers exercised no care in preparing their products for market, but tumbled them pell mell into broken crates, regardless of whether such products were in good or bad condition, would they not be condemned by the health boards of the cities to which they were shipped and no returns be made for the products? And yet this is just what happens in a relative sense to the great American cotton crop during the fall and winter seasons of marketing every year.

The annual cotton crop of the Southern states is converted into more actual dollars each year than any other agricultural product in the world. From a strictly monetary standpoint, it is the most valuable crop on earth. The exports of the American cotton crop bring back to the United States twice as much gold as all the grain, lumber, meats, poultry and dairy products exported combined The exports of the cotton crop maintain and hold the balance of trade in favor of the American Union in its international trade with foreign countries. The cotton crop is the bed-rock basis of the life, hope and prosperity of twenty million people who constitute the population of the twelve cotton growing states. While all these are admitted facts, it is like wise true that no other agricultural crop in the world is handled between producers and consumers in so shameless and careless a manner as this great staple product of the Southern farms. The net annual losses to the producers of the cotton crop caused by the antiquated methods of baling now in vogue and carelessness in handling, amounts to considerably over fifty million dollars.

The wretchedly bad manner in which American cotton is handled is due in the largest measure to an old antiquated system employed by the cotton buying firms in America and the monopolistic influences of the large cotton compress corporations. The producers have not been encouraged to handle their cotton better, because no premium attaches to a good bale as compared with a bad bale. When offered for sale in the local markets, all bales of the same grade go for the same price, as the penalties against the badly conditioned bales are assessed against the good bales in average proportion when fixing the net price to the farmer. The producer is kept in the dark as to the fixed charges assessed against his cotton by the buyers, because he sells at a price based upon the gross weight of his cotton. The spinners who buy their cotton by net weight look carefully into the details of every item which goes into the fixed charges of a bale from point of original shipment to final destination. The spinners therefore realize the many and unnecessary fixed charges which could be eliminated by a more economic handling of the cotton from the ginnery to

COTTON STORED IN OPEN YARDS AT SAVANNAH, JANUARY, 1912. UNPROTECTED FROM WEATHER OR FIRE.

Cotton Stored in the Streets at West Point, Ga. Standing in Mud and Snow on January 10th, 1912.

the mill. They therefore are strenuously urging many reforms along this line and are pleading with the growers, ginners, and the cotton trade generally to inaugurate modern methods which will give to them the benefits of such economies as are now possible in the baling and handling of the American cotton crop.

The spinners pay the last price, hence they pay the maximum price for every pound of cotton they receive, and to cut down these innumerable and unnecessary fixed charges is a matter of great moment to them. Why should the fixed charges against an American bale from interior points in the cotton belt to Liverpool be $10.00, when the charges against an Egyptian bale, weighing fifty per cent. heavier, from Alexandria, Egypt, to Liverpool are only $2.50. Cotton from Egypt and India can be handled and delivered to our New England mills more economically than our cotton shipped from the Southern cotton states to New England. This condition is a travesty upon the great cotton industry of this country and particularly upon twentieth century methods as applied to all other lines of business.

The absence of adequate warehouse and shedding facilities at interior points, and at our ports, are responsible in a great measure for the badly damaged condition of the lint when finally delivered to the mills for consumption. There is not a single cotton growing county in the Southern states which has ample or first-class warehouse facilities for the storage of the crop until ready for sale and shipment. There is not a single large compress plant in the South with adequate shedded platforms to protect the bales from the damaging effects of the weather during periods of congestion at such plants in the fall and winter months.

Standing Between the House and Barn on a Plantation Seven Miles From Covington, Ga. From Photo Made in February, 1912.

Bales Stored on Sticks in a Planter's Yard.

In the Muddy Streets Near the Old Canal, Savannah. Absolutely no Protection From Fire or Weather.

Looking South From Bay Street Along the Old Canal, Savannah, Ga.

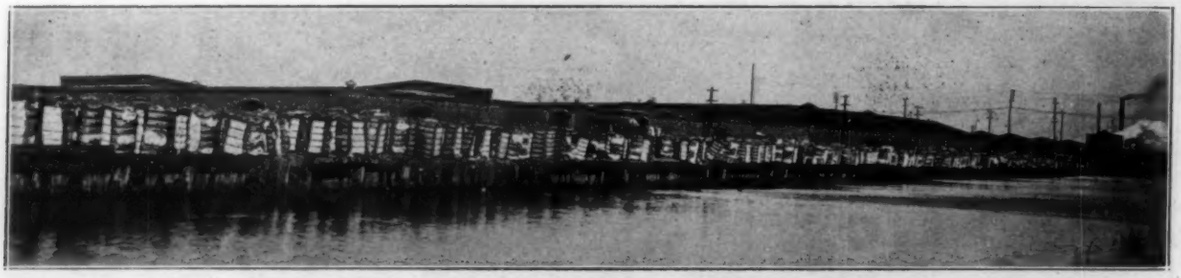
There is not a single cotton port in the South where cotton can be properly stored and kept from the damaging influences of rain, sunshine and wind until it is loaded on the vessels. The majority of farmers who hold all, or a portion, of their cotton crop on their farms until ready for market, leave the bales lying around on the ground, part of the time in the mud, without shelter, and practically without any care whatever. In most of the interior markets the limited warehouse space is soon filled and the balance of the crop when delivered at such points is stored on the streets, on the sidewalks, or thrown on vacant lots, there to lie in the snow, sleet, rain and mud until sold and routed to the big compresses for recompression, where it goes through the same kind of neglect, and then on to the ports for a continuation of such treatment. As a proof that these statements are based upon facts, the reader is specially directed to the accompanying illustrations which were made at several points in the South during the present season. These photographs typifying actual scenes, silently emphasize the almost criminal neglect of which the people of the South are guilty in the handling of this, the most valuable of all staple crops in this country. Cotton has been named, and heralded abroad, as the king of all agricultural products. No other majesty has ever been treated so unroyally, or left without shelter, lying about in the mud and had so little care and attention paid him by his millions of dependent subjects as "King Cotton."

The tendency to construct cotton warehouses at all interior marketing points in the South has had quite an impetus during the past seven years. Especially is this true

Seed Cotton Partially Exposed to the Weather. Wet and Damaged. February, 1912.

in the cotton states west of the Mississippi river, where, prior to 1905, a local warehouse was almost unknown. In Texas and Oklahoma cotton was hauled in at market points and dumped on large open cotton yards which were fenced

When the Warehouses are Full It Is Left in This Condition for an Indeterminate Period.



Along the Old Canal at Savannah, Ga., on January 5th, 1912.

around with barbed wire. Hundreds of thousands of bales could be seen, stored in this way in a day's railway journey in Texas seven years ago. But since 1905 several hundred local warehouses have been built in that territory and the situation is gradually evening up with the facilities inaugurated at an earlier period in the old states.

The facilities for warehousing are yet, however, far from adequate and too many farmers are still holding their cotton unprotected on the farms, and only patronize their local warehouses when they deliver the staple to market for sale. In some of the largest interior cotton markets in the South the old system of sampling and buying cotton from wagons on the streets is still in vogue. Very few of these numerous local warehouses which have been constructed during the past few years, have been built with a view to adequate space in storage, or economy for insurance. They are small, constructed of cheap material and few of them have any of the modern protection appliances in case of fire. Owing to these facts the average local insurance rates on cotton stored in these warehouses is from three to three and one-half per cent. per annum on the one hundred dollars market valuation of the staple. This is excessive and abnormally high, but the rate is based upon the extraordinary hazard of cotton and the absence of fire protection about the average warehouse.

A first-class cotton warehouse properly constructed with overhead sprinklers, and abundant water supply, can secure a rate of fifteen cents for twelve months on each $100 valuation of cotton stored, or a little over one-half cent per bale per month. At present the average insurance charge to the farmer on his cotton stored in these unequipped warehouses is fifteen cents per bale per month. The economic savings in the insurance rate on cotton in a first-class and thoroughly equipped warehouse will in a short time pay all the extra cost of equipment. The high cost of storage, insurance and interest on borrowed money are the three main factors which cause thousands of farmers to

A Sidewalk Warehouse in West Point, Ga. Photographed in January, 1912.

Another January Sidewalk Scene in West Point, Ga.

On Bay Street, Savannah, January 5th, 1912.

AT A COUNTRY GIN NEAR COVINGTON, GA., FEBRUARY, 1912.

refuse to store their cotton in these local warehouses and borrow money on the warehouse receipts so as to market their crops slowly. They prefer to take chances on holding their cotton on the farm without cost, and without protection, until they get ready to market it. Those who owe money prefer to sell, even in a glutted market, to paying the excessive charges as above enumerated. Hence we witness each season an enormous over-supply of cotton rushed on the market and sacrificed at such prices as the speculative cotton trade sees fit to offer.

A wide and persistent campaign of education is imperatively needed to reach those directly engaged in the production and handling of the cotton crop in order to stress the needs of economic reforms for which the spinners of the world are constantly clamoring. The growers must be taught that cotton will not bring its full intrinsic value in the markets of the country until the staple is properly and economically baled, free from dirt, trash, excess bagging and the damaging influences of rain, snow, wind and sunshine. They must be taught the economies resulting from, and the necessity for, constructing adequate warehouse facilities for the proper storage of the cotton at all interior markets. They must demand the enactment of state legislation which will require all large compress plants, railroad platforms and our ports to be equipped with such storage facilities as will ensure the proper care and protection of the staple from the weather. Every dray load of cotton handled across the streets of Liverpool, or Manchester, is covered with large tarpaulin sheets to prevent the possibility of even slight damage from excess moisture in the atmosphere, or a sudden shower. When a bale of cotton is delivered into the hands of the spinner the lint is handled from that time on with extreme care and with some regard for its textile value.

ANOTHER PLANTER'S BACK YARD WAREHOUSE.

Recently the Bureau of Plant Industry at Washington, D. C., has decided to begin an active campaign for the better handling, covering and baling of the American cotton crop. The efforts of the U. S. Department of Agriculture through the Bureau of Plant Industry will unquestionably be of very great benefit in hastening these needed reforms. What the government has already accomplished through its demonstrating field work in the interest of diversified agriculture during the past few years, is an ample guarantee of its thorough ability to aid cotton producers in the important work of applying economic reforms in the proper baling, warehousing and handling of the cotton crop.

AT ANOTHER GIN IN GEORGIA.

What is needed, are ample warehouse facilities, so constructed as to guarantee minimum insurance rates; and the issuance of a guaranteed warehouse receipt which will command loans at the lowest rate of interest. With the bales gin compressed at the ginnery, and covered with not exceeding twelve pounds of tare, and then stored in high-class warehouses and marketed slowly to meet the consumptive demands of the mills, the reforms which have so long been demanded, will be realized, the growers will be millions of dollars better off and the spinners will be rid of the most troublesome matters with which they have to contend in the consumption of American cotton. The spinners, bankers and merchants of the South could render no better service to the American cotton industry than to exercise their energies and influence in behalf of an active campaign toward encouraging a prompt enforcement of all the needed economic reforms in the baling, warehousing and marketing of this greatest Southern commercial crop—cotton.

AT A COUNTRY GIN. BALE IN FOREGROUND WAS LYING IN MUD AND WATER.

COTTON WAREHOUSE CONSTRUCTION.

(Contributed Exclusively to COTTON.)

BY FRED S. HINDS, ARCHITECT AND ENGINEER.

The too common method of building warehouses of wood and using flimsy construction is not compatible with the present day value of their cotton contents. The storing of eight cent cotton in such buildings was bad enough, but when compared to ten and fifteen cent cotton, the profits that can now be made does warrant a better housing. The better baling of cotton would also tend to better care in storage and handling and thus it would be in good condition for its disposal to the textile manufacturer.

A better class of building means less wear and tear, thus less expenditure for repairs. The higher grade of building in the slow burning mill construction type meets the ideas of fire insurance companies and will secure lower insurance rates on both building and contents.

COMPARTMENT WAREHOUSES OF THIS DESCRIPTION MAY BE BUILT AT A COMPARATIVELY SMALL COST.

Cheaply constructed floors have been the most common method and therefore, short-lived. Why not lay a better floor which will last longer and as a result be the cheapest in the long run. Portland cement is now a cheap cement and concrete is now becoming so popular that it is bound to be the floor for future cotton warehouses.

Such a floor is composed and laid as follows: First, the ground is leveled the thickness of the concrete floor from the top of the door sills. Then a base placed or laid on the solid earth bed consisting of a layer of concrete three inches thick. One part best Portland cement to eight parts of aggregate of either crushed stone or clean screened gravel makes a good mixture. The top or finishing coat should be three-quarters of an inch thick and should be of a mortar consisting of one part best brand Portland cement and two parts sand—to be applied while the base is still green. This coat is finished in the usual manner with trowel, floating to a smooth surface.

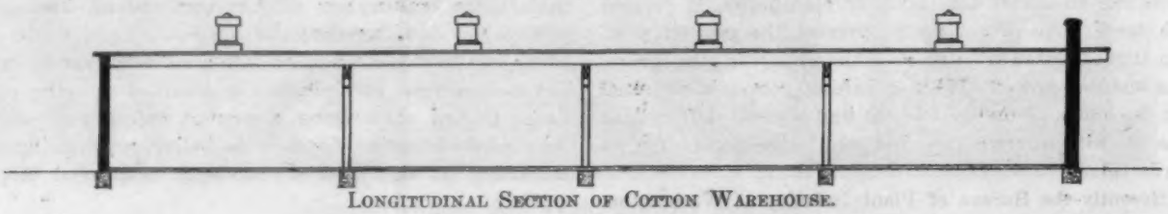
As concrete expands and contracts under variation in temperature, joints are generally made by cutting up the floor into slabs seven to eight feet square. These joints extend down through the full depth of the concrefe and a number of these squares are laid at one time. The trowelled top gives the same finish as that of cement side walks and are durable and will stand the usual amount of trucking without appreciable wear. The roof should be framed in slow burning mill construction with hard pine rafters and girders supported on square hard pine posts which stand on concrete piers.

On the rafters is laid a roof plank from two to three inches thick depending on the span of the plank from rafter to rafter. The plank to average eight inches wide, tongued and grooved and planed on one side to make all an even thickness. These flat mill constructed roofs can be covered with either tin roofing or felt roofing to make them water tight. For the Southern climate, a serviceable covering to be used is the coal tarfelt and and coal tar pitch finished with small gravel stones, washed clean or steam coal slag and sometimes crushed stone where gravel or slag is not available.

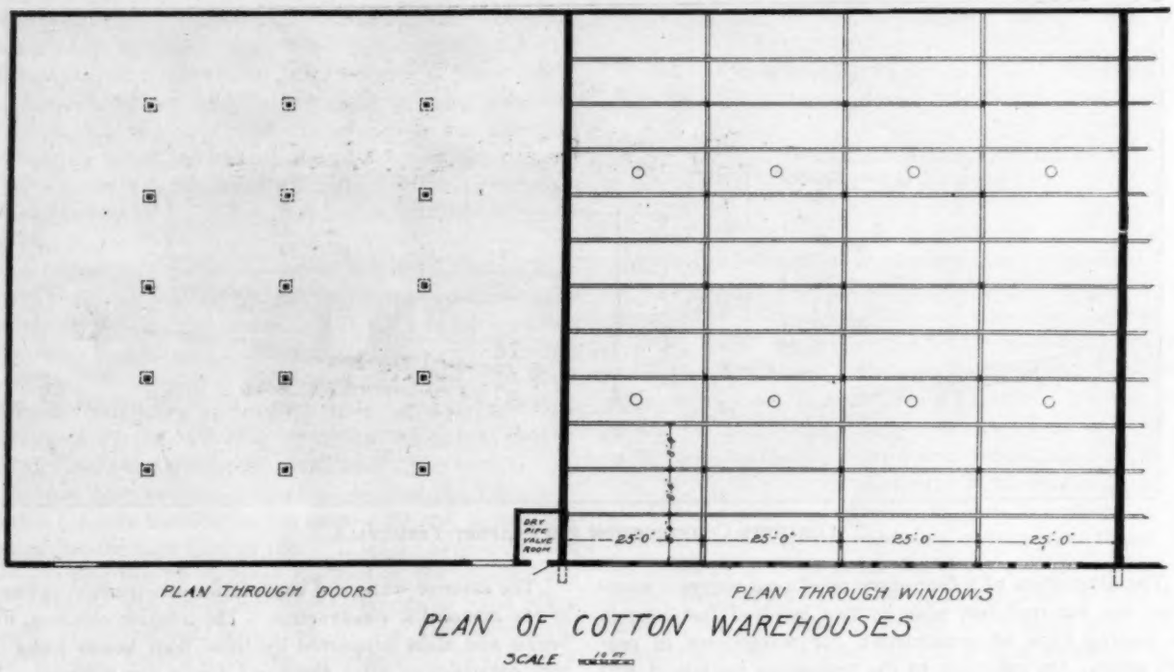
At certain intervals large round metal ventilators are set upon the roof, making them strong and secure to the roof plank. These ventilators should have a damper to operate from floor to keep out the heavy rain storms. With these ventilators and with the windows on the front, a good system of ventilation can be secured. The windows are located on the front of the warehouse and have so many openings, that for fire protection all other walls are in solid brickwork.

To give a good appearance to the brickwork, the bricks should be culled or selected for even color for laying up the outside face of the brick walls. These walls are laid in lime mortar without the use of cement. The division or fire walls of brick are commonly laid twelve inches in thickness but as a fire in one compartment has been known to set fire to bales of cotton up against the wall on the opposite side in the next compartment, it is good judgment to have all division walls sixteen inches in thickness. Then above the roof line reduce to twelve or eight inches in thickness. The extra cost of four inches of brickwork may save a whole compartment of cotton bales.

The ventilation of these houses is becoming more practiced and it will be noted that eight metal ventilators are distributed on the roof of each compartment. Metal louvre ventilators should be built into the rear wall at the top just



LONGITUDINAL SECTION OF COTTON WAREHOUSE.



PLAN OF COTTON WAREHOUSES

SCALE 1/8 IN. = 1 FT.

under the roof. With the front windows slightly opened and the above ventilators, the houses would have a first-class system of ventilation.

A system of fire protection, if installed in this class of construction, will make each compartment nearly fireproof. A sprinkler system is possible where the town water is in the street or roadway, and the main valves can be located in the small room shown in one of the compartments and the connection with the town water system can be made here.

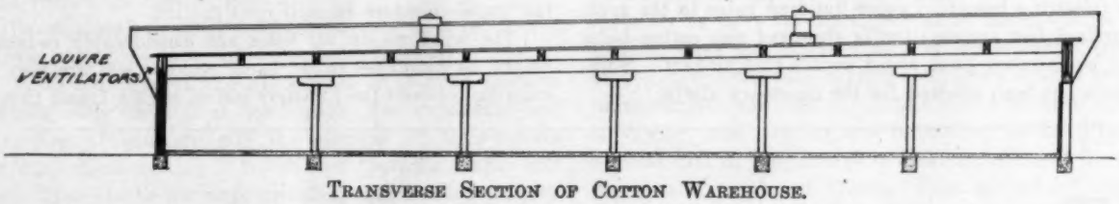
In order to protect this wet system from freezing a small amount of steam piping can be installed and connected wtih the boiler plant. Where no boiler is available a "dry pipe system" can be used with special valves in the valve room for controlling the supply until wanted, thus preventing all chance from freezing the sprinklers. As this system of fire protection can be installed for from three hundred to four hundred dollars for each compartment, it will be seen that this is a very small amount to make the compartments nearly fireproof.

Taking each compartment separate, the amount of materials that cover the bulk of the construction are as follows:

Concrete foundations and piers, 750 cubic feet; for concrete floor 4 inches thick, 3333 cubic feet; the end or odd wall 250 cubic feet of concrete foundations and 28,800 brick. It will take 80,000 brick for walls, 12,000 feet B. M. Georgia hard pine timber for rafters, girders and columns, and 24,000 feet B. M. of 2-inch Georgia pine roof planks.

The approximate cost per square foot to erect these compartments complete, except the sprinkler system, during 1912 would be about 60 cents per square foot, or about $6,000 per compartment. The capacity of each compartment, 100 feet square, will admit of the storage of about 1,200 common standard cotton bales on end.

[The variation in the price of labor and of construction materials in different sections will no doubt modify these approximate cost prices; while the use of other materials than brick for the front and rear walls, or perhaps some slight changes in the roof construction to allow the use of other covering materials thereon, might better suit the ideas of the individual owner. Reference to the article on fire protection systems will show how this and similar warehouses may be equipped with automatic sprinklers.—Editor.]

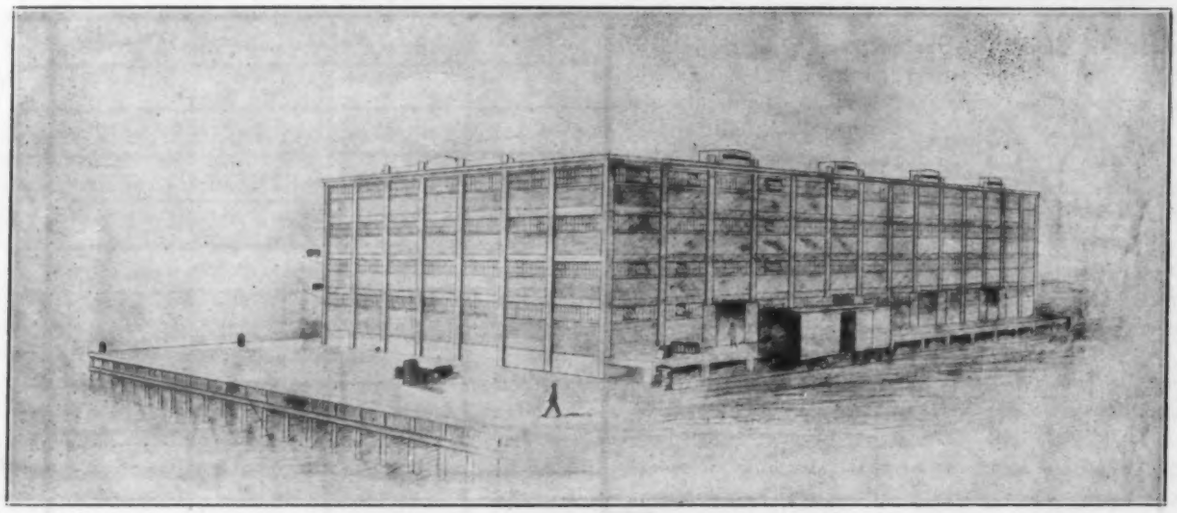


TRANSVERSE SECTION OF COTTON WAREHOUSE.

COTTON WAREHOUSES FOR SEAPORT TERMINALS.

Seaport warehouse facilities for the proper storage of cotton, at prominent railroad terminals, should have a most practical and business-like method of handling and storing the cotton.

The only type of construction, and the most economical, all things considered, is that of reinforced concrete. This construction is the best and cheapest fireproof construction now known. To carry the light load of cotton bales stored on end in the low stories would not require heavy construction, but could be of the highest method.



Concrete Construction for Seaport Terminals.

The illustration of a four-story reinforced concrete warehouse one hundred feet wide by two hundred feet long is the coming type of construction for warehouses in seaport cities. On referring to the transverse section, it will be observed that the cotton bales on leaving the freight cars run into the houses on to an elevator and by same, delivered to the several floors and stored ready for shipment.

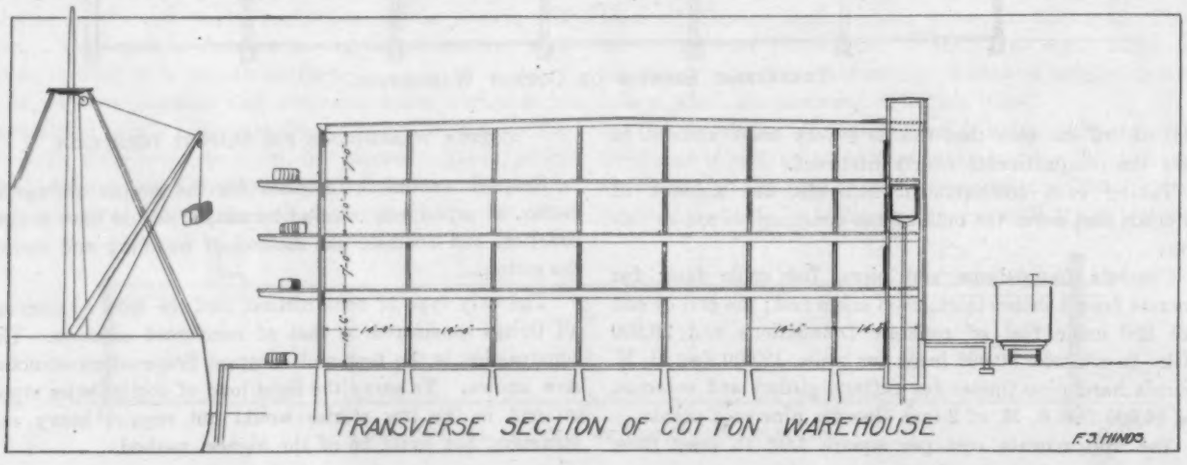
With the steamship alongside of the dock or pier, the cotton bales can be moved out of the house onto the platforms at the several stories. On referring again to the transverse section, it will be noted that these platforms are on the opposite side from where the cotton is received, so that the bales pass from the railroad cars directly across the building to the shipping platform. The derricks of the steamship can be utilized in handling bales from the platforms, thus eliminating the necessity of the steam plant for power in connection with the warehouse. The hook of the derrick can readily pick up the bales as they are pushed out to the edge of the platforms, swung around and dropped in the hold of the vessel. It will be noted that the floor of these platforms can be constructed on a cantilever principle, thus removing any obstructions like columns on the other side.

The capacity of this type of warehouse can be figured on the following basis: Twelve hundred bales to the area, one hundred feet square, that is standard size cotton bales on end, compressed bales about double this amount. Sufficient area has been allowed for the necessary alleys.

The exterior walls and the interior construction is known as the monolithic construction. The interior columns, floor beams and slabs supported by these floor beams looks like mill construction after the wood forms are removed. The columns and beams are considerably smaller than the earlier work in reinforced concrete. In fact, if they were painted, it would be hard to tell whether they were wood or concrete, to the casual observer. The shorter spans that can be used, in a practical way, as compared to the long spans in mill construction, will also tend to lighten or reduce the size of the beams or columns. The floor slabs to be finished in granolithic Portland cement, which is the top finish about one inch thick of clear cement and sand in proper proportions, giving a similar finish to that of Portland cement concrete sidewalks.

The exterior walls to be built entirely in reinforced concrete including pilasters and the cornice or alternate construction which combines the red brick with the gray of the concrete, giving a very pleasing effect. The brickwork should be used only between the window lintels and the window sill above and between pilasters, or what might be designated, the exterior columns. These pilasters, which come fourteen or sixteen feet on centers, are not large as compared with the usual pilasters in mill construction.

The windows on all sides are considerably reduced in height, as compared to the usual window and are very wide running between the pilasters but of such a frame that they



are placed directly at the floor slab above. They help to diffuse the light from the highest point at the side of the room, which is bound to light the center sufficiently even as wide as one hundred feet for the width of the building.

The only proper thing to use would be metal sash made of solid bars and solid steel frame such as are becoming popular in some sections of the country, where concrete is used extensively for factory buildings. Sections of these can be swung on swivels or pivots for opening to insure proper ventilation. Right here it should be stated that while this steel frame may cost just a little more than wood in the South, in the North they are getting down to almost the same price for the reason that it takes heavier window frames for such large areas than the common size of frames. It will also be noted that the usual mullions are eliminated, which is not possible with wood frames but the greatest advantage is in the fact that when this warehouse is completed, there is no woodwork in the building to burn.

It has now become a practical engineering feature to erect a concrete building on the usual piles and timber grillage of the ordinary dock or pier. It would have to be built stronger and heavier to carry the load of the building and its contents. The use of reinforced concrete or wood piling would be determined, somewhat, by the local conditions. The railroad platform on the elevator side of the warehouse could be constructted in concrete and thus be very valuable as compared to the usual one of wood.

The elevators could be of the plunger type operated by water pressure from the city or town mains. This would eliminate any need of power installed on the plant or electric elevators could be substituted by power from a central power plant. These could be large in area, lifting a number of bales at a time. On account of the low stories, it would be necessary to have pent houses for each elevator to give height for the sheaves, etc.

A sprinkler system should be installed to properly protect the contents, as it is common for a fire to occur directly from the interior of a cotton bale. The system of sprinkling can be along the dry pipe or wet system, whichever is preferred, and most advantageous to the location of the plant. All doors throughout the warehouse are to be of wood core metal clad type running on metal bar tracks. In very long warehouses it would be advisable to erect fire walls, dividing it into large sectional areas which, no doubt, would reduce the cost of insurance.

The usual way in which to finish the roof of a reinforced concrete warehouse is to apply the tar and gravel or asphalt roof finish with gravel and pitch, such as is most common in textile mills throughout the South. The expansion and contraction of concrete and the changes of temperature doesn't admit of making it waterproof, because cracks will occur. This breaks the waterproofing, thus causing a leaky roof.

The height of warehouses in reinforced concrete is not as limited as in the days when it was introduced as a warehouse type of construction. Reinforced concrete office buildings in the city of Atlanta are much higher than this warehouse. Office buildings and warehouses of ten and twelve stories are being erected in different parts of the country. The higher the building in reinforced concrete, where it is possible to use the forms again and again, reduces the cost per square foot by floor areas.

No painting will be required throughout the whole building except that of the metal window frames and the metal clad sliding doors.

FIRE PROTECTION SYSTEM FOR WAREHOUSES.

WHY THIS FEATURE HAS SO MUCH BEARING ON INSURANCE RATES.—A COMMUNITY OF INTEREST SUGGESTION.

(*Contributed Exclusively to* COTTON)

BY SIDNEY G. KOON.

A typical storehouse in the South for the reception of baled cotton consists of a building one-story in height, and of whatever total area may be necessary for the particular needs of the locality. Whatever the area may be, the building should be sub-divided into compartments, none of which has a greater area than 5,000 square feet. It is usual in such a case to construct a building 100 feet wide, and of whatever length may be necessary, and to subdivide it by solid walls into compartments measuring 50 feet or less, in the direction of the length of the building.

For the proper protection of such a building and its contents from fire, it is necessary, among other things, that no lights be allowed about the place, and that except for steam heat, or possibly, as explained later, a little local electric heat, no heating devices or fires of any sort be permitted upon the premises. It is also necessary in the general case to limit the cotton storage to one tier of bales. The bales may be set on end, thus taking advantage to the fullest extent of the storage possibilities, but there should not be a second tier above the first. The reason for this will be apparent when it is realized that fire starting from any cause in the middle of a vast mass of such material could smoulder and spread in all directions almost without hindrance. Even should the temperature be sufficient to set off automatic sprinklers in considerable number, one could hardly expect the water distribution from these sprinklers to penetrate down through the mass of smouldering cotton, when the cotton is piled deeper than one tier.

Each section of the building as above outlined, should have a system of automatic sprinklers supplied by one riser. If there is danger of the water system freezing up during the winter, as is the case in almost all localities, either one of two general methods of treatment may be used. In the first place, if the temperature never falls much below the frost line, which would be the case in most places in the cotton belt, it might be considered wise, and would certainly be more readily approved by the insurance fraternity, to have the different compartments heated by a line of 1½-inch steam pipe carried completely around each compartment near the ceiling. Steam would be used, of course, only when cold weather was impending or actually in existence; that is, just enough to make certain that the sprinkler system would not freeze. This method of treatment would involve the installation of a steam boiler, probably in an out-building, and would require the services of someone to keep it going whenever necessary.

The other method of treatment would require the installation of a dry-pipe valve in a valve room, insulated from cold by means of double walls with either a dead air space between or possibly something along the line of felt or mineral wool sheathing. This dry-pipe valve would be located in a small separate building. In some cases it is put in the middle compartment of a building, containing not more than four or five compartments. In either case it controls the water supply to the entire building. If the building is more than 250 feet in length, that is, if it contains more

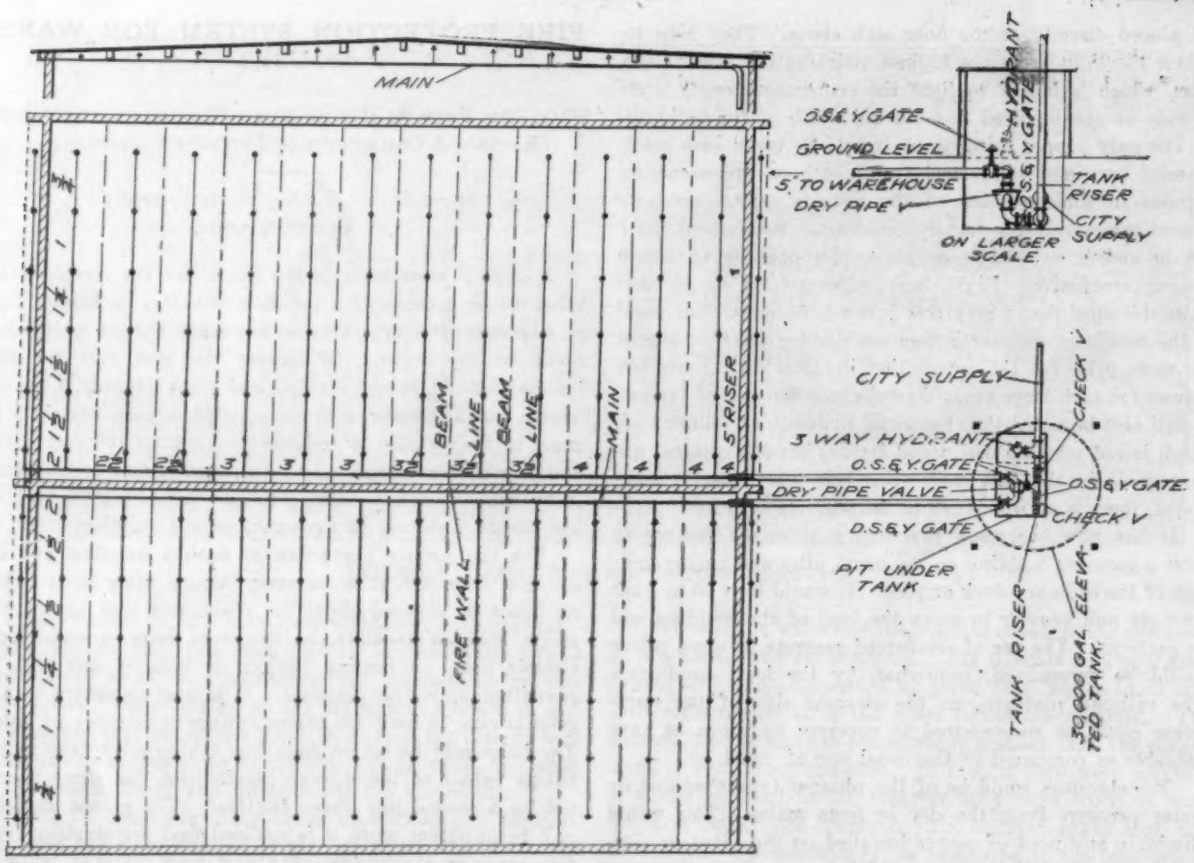


Fig. 1. Plan Showing General Construction and Distribution.

than five compartments, it would be advisable to fit two or more dry-pipe valves, letting each take care of three or four compartments.

The dry-pipe valve room would be sunk well beneath the ground, and in some localities would require probably in the coldest weather a little heating. This could be done either by means of a steam pipe from some other heated property in the neighborhood, or preferably, either a bank of incandescent lamps located close to the water line at the lower part of the valve, or a small electric radiator connected with an electric thermostat set to operate whenever the temperature should fall below 40 or 45 degrees Fahr. This latter method would be ideal so far as consumption of electric current was concerned, because none would be consumed except when needed, whereas, with the bank of lamps, or any other method of heating, current would be consumed whenever turned on and until somebody again turned it off.

It has been found satisfactory in most cases to depend upon the air insulation to keep this dry-pipe valve room free from frost. The usual construction would show a small building, possibly 7 or 8 feet square, with the valve room entirely below the ground level, and with a small compartment above, which might be merely an insulating compartment with a trap door in the roof and a corresponding trap door in the diaphragm between the insulating compartment and the valve room. This diaphragm should be located from 6 to 12 inches under the ground level, while the wall of the building should never be less than six inches

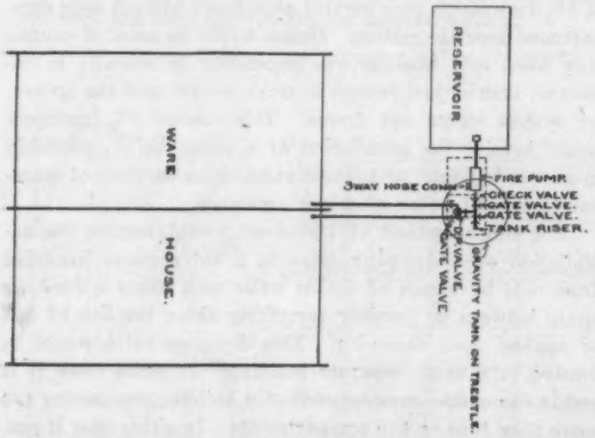


Fig. 2. Water Supply Connections Using City Supply and a Tank.

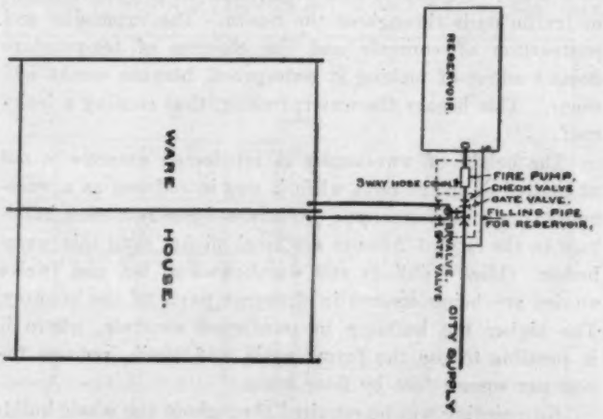


Fig. 3. Connections for Water Supply When Using Fire Pump in Connection With City Pressure.

above ground level, to keep surface water from entering. A modification of this arrangement would show a two-story building, the floor between them being 8 to 10 inches below ground level, while the upper story would be used for hydrant connections, motor-driven air compressor, and in some places as a hose house.

Where this small building is used, it is customary to connect the dry-pipe valve to a header from which the several mains are taken underground to the different compartments controlled by this one valve. In each of these mains will be located both a shut-off valve and a check valve, while beyond the check valve is the usual drip. All three of these fittings are within the valve house. The purpose of the check valve is to enable the dry-pipe valve to operate after the exhaustion of air from the lines in *one* compartment, without requiring that all of the compartments be drained of air. This makes it possible for the dry-pipe valve to get into action more quickly than where this check valve is not fitted.

The water supply for the best protection would necessarily be from two independent sources. These might be any two of the following: Reservoir pressure from either public or private mains. Elevated gravity tank. Underwriters fire pump, either electric or steam.

In the case of the fire pump, a steam supply might not be at hand, but electric power is everywhere available. The air compressor for the dry-pipe system would be operated when necessary by either an electric motor or a small gas engine; this engine would, of course, be located in a small separate building. The gravity tank would be located on a tower or trestle, erected preferably a little distance (40 or 50 feet) from the storehouse. In case such a tank is used, the elevation of the bottom of the tank above the roof of the building should not be less than 25 feet, and could profitably be made 40 or 50 feet. This latter height would give a water pressure above the sprinkler heads of about 20 pounds per square inch, which would permit each sprinkler to discharge about 25 gallons per minute, an amount which ought to be sufficient in the usual case to drown out any fire in its neighborhood. The tank capacity depends largely upon the character of the other source of water supply. If a city main with good pressure is available, then the tank would be called upon for feeding possibly 25 or 30 sprinklers for half an hour, this being probably an extreme case, but one for which provision should be made. This means that the capacity of the tank should be probably 25,000 gallons or upwards. The tank may be made of either wood or steel, the former being reinforced by external steel bands.

In the usual case of sprinkler protection a good water pressure is of more importance than a large supply, for the reason that it has been found in many cases that a single sprinkler operating under a heavy pressure will completely extinguish a fire under circumstances which would be likely to defeat half a dozen sprinklers operating under weak pressure. In the case of a cotton storehouse, however, the situation is different. The cotton is apt to smoulder a long time down in the middle of a bale, and copious soaking by water is necessary before it is put out. In some cases a number of sprinklers are kept in operation for three or four hours before the extinguishment is complete. The function of a heavy pressure in this case would be to simply make the flow from the sprinkler faster than would be possible with weak pressure, with the result that the necessary soaking down would be accomplished more quickly.

If the storehouse is in a city having a good water supply of its own, it would be quite satisfactory to feed the sprinkler system from the city mains, provided these could be tapped on *two different* streets, thus providing, in effect, the dual supply which is necessary for best security. In all of the above it should be remembered, however, that a single source of supply would probably, in nine cases out of ten, be satisfactory from the actual protection standpoint; although, naturally, it would not command the same measure of respect from the insurance companies, because of the fact that an accident to this single souree would temporarily leave the plant totally without protection. As a result, the insurance premium reductions with a single water supply would be considerably less than when a duplicate supply could be obtained.

The distribution of the sprinklers in the plant involves

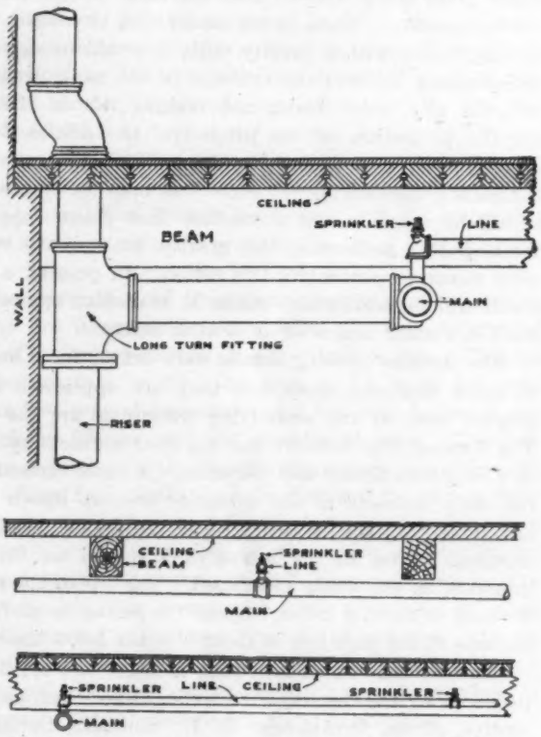


FIG. 4. CONNECTION DETAILS FOR SPRINKLER PIPES.

very little complication, although, necessarily, the work would have to be done with a great deal of care in order to fully meet the approval of the underwriters. Several diagrams are appended, showing in outline the general method of distributing the water throughout the building, and giving details as to the installation of fittings. It will be seen from Fig. 1 how the riser in each compartment distributes the water through the main, to the lines, and thence to the sprinklers. The plan shows two compartments, the double lines around the edge being the walls, while the broken lines running across are the beams or girders for the roof. The riser is placed at one corner of each compartment. As will be noticed, this feeds a main running from end to end of the compartment, and varying in size of pipe from a maximum near the riser to a minimum in the last bay at the other end. This gradation in size is indicated on the drawing. This main in turn feeds several

lines, one of which will be found in each bay. These lines again diminish in size from the main towards the last sprinkler. The sprinkler heads are mounted upon the mains at distances of 8 or 10 feet, as noted. A line of sprinklers is also commonly fitted outside, under the eaves, as shown.

The diminution in size of pipe from the riser to the last sprinkler is always gradual, and is a necessity in order to keep the pressure at the several sprinkler heads about uniform. In addition to this, the entire system has to be laid out in such a manner that each line drains toward the main while each section of the main drains towards the riser. By making this provision, it is easy to drain the water from the entire system by means of a draw-off pipe, at any time when it may become necessary.

The several diagrams showing method of arranging water supplies are self-explanatory in the main. It will be noticed in Figs. 2 and 3 that a check valve is placed in each independent source of supply, in order to prevent water from being drawn from the other source into the one in question. Thus, in the case of the city water main in conjunction with a gravity tank, it would be extremely embarrassing to have the contents of the tank drawn off into the city water main, and nothing left in the tank for the protection of the property. In addition to the check valves, each source has a post indicator valve for controlling the supply of water as may be needed. It should be noted in this connection that where danger of freezing is considerable, the gravity tank would require some means of preventing this action. In general, a small steam coil is used, where steam is available; otherwise, a small hot water heater or an electric heater.

The sketches showing details were drawn for a building of more than one story, but they are applicable to the present case, as the underlying principles are the same. The drawing Fig. 4 shows that the riser connects by means of a long-turn fitting with the main. A short vertical from the main connects to the sprinkler line, as shown in all all three of the sketches. The sprinkler heads are mounted in the line by means of a special tee fitting at intervals, as previously mentioned. The top of the sprinkler head is about 4 inches beneath the ceiling or roof, while the axis of the pipe line is about 9 inches below the roof.

The sketches which have been used for this article were prepared by the General Fire Extinguisher Company, (executive offices, Providence, R. I.; Southern Department, Atlanta, Ga.), the makers of the Grinnell automatic sprinkler equipment. One of the Grinnell heads is also illustrated in Fig. 5 to show the general type of unit used for this sort of work.

A brief description of this automatic unit, which is itself an excellent example of inventive genius, would not be without interest. The head, which is screwed into the fitting on the line, contains a glass hemispherical valve, fitting into an opening in a flexible diaphragm. This valve is held in place by means of a diamond-shaped strut consisting of three pieces, joined together by fusible solder which melts at about 155 degrees Fahr. The pressure of water under the diaphragm holds this tightly against the valve, and the general design is such as to make a leak practically out of the question. When, however, the temperature reaches the fusing point of the solder, the entire strut falls apart, and a one-half inch stream rushes through the orifice, strikes the deflector at the top of the head, and is scattered in all directions

The discharge from each sprinkler head is designed to cover an area of from 80 to 100 square feet, which it does so copiously as to entirely extinguish in the great majority of cases all fires starting under it. So effective has this means been found that, in very many instances, the only knowledge there is of a fire comes from the alarm set off by the sprinkler itself, or the water flowing over the floor. A further illustration of the promptness with which these units act might be gathered from the fact that fully 30 per cent. of all fires occurring under these sprinkler heads are extinguished by the action of a single sprinkler, while more than 56 per cent. call into action not more than three sprinklers.

In cases where it is necessary to use the dry-pipe valve, the installation is practically the same, except that a dry-pipe valve is interposed between the main water supply and the riser. A further difference lies in the fact that the lines, mains and risers are filled with air at a moderate pressure, instead of with water. This air acts upon the upper surface of a diaphragm in the valve, while water

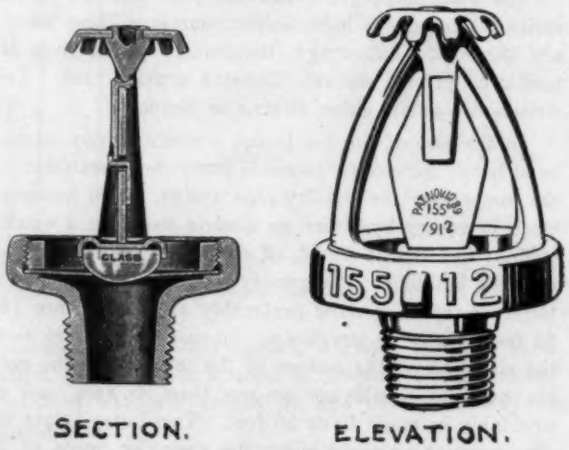


FIG. 5. A TYPE OF AUTOMATIC SPRINKLER HEAD.

pressure is against the lower surface of a valve connected with this diaphragm. The ratio of areas is such that it is possible to use an air pressure of about one-fifth or one-sixth of the water pressure and still have the system tight against the water. When a sprinkler goes off, from the usual cause, the air in the pipes is released, thus opening the dry-pipe valve for the passage of water. This water, rushing into the system, finds the open sprinkler, and from this point on the operation is identically the same as with the ordinary wet-pipe system.

Mention has been made of the alarm set off by the sprinklers. It should be noted that in practically all recent installations a small water motor is installed in connection with the riser, or the dry-pipe valve, as the case may be, in such a way that as soon as water begins to flow through the system, due to the action of a sprinkler, this motor automatically rings a large gong situated on the outside of the building. In addition to this warning of the existence of a fire, a secondary electric alarm is frequently fitted. This rings a bell, either on the outside wall of the building, or in the quarters of someone connected with the establishment. In some cases, arrangements have been made for extending this electric warning to the fire department of the town. In the case of either of these forms of warning, the bell continues to ring until the water has been shut off. This means that human attention has to be given

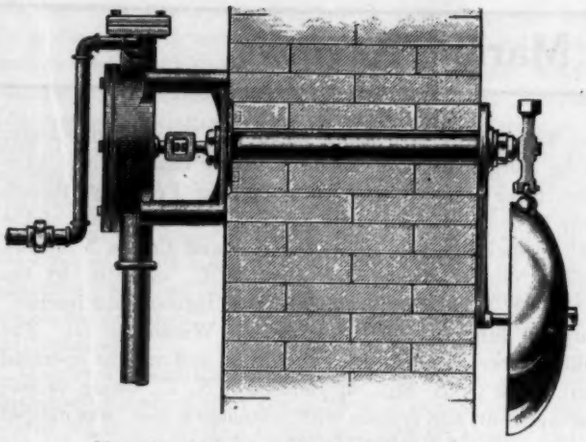


FIG. 6. A WATER MOTOR FIRE ALARM.

to the fire, or, as is more frequently the case, to the water flowing after the fire is out. In this manner the protection is taken care of, not only from the point of view of the fire which has been extinguished by the sprinklers, but also from the question of water damage, which might be considerable, were it not for the prompt alarm and subsequent shutting off of the water after the sprinklers have done their work.

It should be here noted that only as many sprinklers will operate as are subjected to the temperature at which their struts are designed to fuse; in other words, a small fire might set off not more than one or two sprinklers, with the equivalent amount of water flow. This reduces the water damage to an absolute minimum, and is of very great importance in connection with the saving of the stock from this form of damage, and also from the insurance standpoint.

It should be remembered that while the description above given presupposes a building of a good type of construction, the automatic sprinkler protection is equally applicable to any form of building, or even shed, which might be adapted for the purpose of cotton storage. The roughest sort of a structure could be thus protected, even if there were no sides to it; but of course best results would be obtained if the roof and sides were sufficiently tight to prevent a considerable draft of air through the building. Two or three instances are on record where a heavy draft carried the heat horizontally away from the sprinklers to such an extent as to permit the fire to gather considerable headway before any of the sprinklers opened.

In cases where the cotton ownership is distributed among a large number of individuals or firms, it might not be feasible to store the material all under one roof. In such cases it is not only possible but very desirable to install an automatic sprinkler equipment for several properties in a locality, by means of a sort of community arrangement. This would entail a considerable saving in expense to the individual owner, especially in connection with the installation of such forms of apparatus as the large gravity tank, steam heating plant, or the fire pump and perhaps the dry-valve equipment. It will be recognized that the chances of having fires in several different properties simultaneously are rather slight. This means that an elevated gravity tank sufficient to properly protect one property would be *almost* large enough to protect half a dozen.

A very interesting instance of this form of community protection is afforded by an installation made in Fort Smith, Ark., by the General Fire Extingisher Co., of Texas. In this case about a dozen concerns, including wholesale dry goods, hardware and furniture stores, a harness factory and a large stable, joined together in the installation of an equipment including a single 100,000-gallon tank on a high tower, with supplies distributed over the several properties, and connected by electric alarm with the fire department. A recent small fire in the basement of the harness factory brought the fire department to the scene, only to discover that the fire had been entirely extinguished by the sprinklers.

The prompt response possible under such a system of protection is exceedingly valuable, in view of the fact that the vital point in the life of a fire is in its first five minutes, before it has had a chance to attain destructive size. This is the period of operation of the automatic sprinkler, and it is to this fact that is due the wonderful record of efficiency made by this device. During the fifteen years ending with 1911, the National Fire Protection Association reports show that more than 95 per cent. (in 1911, 96.6 per cent.) of all fires under automatic sprinklers were either entirely extinguished by the sprinklers, or prevented from spreading until the fire department reached the scene. Not only this, but more than half of the cases of failure were caused by the systems having been tampered with, either by the shutting off of the water or by other means; and it will be very apparent that a sprinkler system with the water shut off is about as valuable a protection as a line of empty pipe.

The recognition of the automatic sprinkler proposition by the fire insurance interests takes the very substantial form of a large reduction in the premium rate. This reduction amounts in the usual case to 40 or 50 per cent. for the best type of equipment, and has been known to run as high as 83 per cent. in exceptional cases. The percentage reduction in the insurance premium, however, is in itself of less importance than the fact that the saving from this source is sufficient ordinarily to pay for the entire equipment within a period of about five years. In exceptional cases the equipment has been paid for by the savings in less than two years, while of course, in other cases the period will extend beyond the average. In all cases, however, it is quite apparent that once the period has expired, the continued saving in insurance premium is clear gain to the man who has to pay the premium.

A Cotton Section of the Southern Commercial Congress convention at Nashville, Tenn., April 8th, 9th and 10th, will be presided over by the Hon. Harvie Jordan, of Atlanta, as chairman. The subjects discussed will be: "Better Baling"; "Better Protection from the Elements by Warehousing, Etc."; "Financing Cotton in Storage"; and "Fixed Charges Against American Cotton." Everyone interested in cotton in any form should attend.

The assistant chief warder of a government prison in a foreign country informs an American consulate that he desires to get in touch with American manufacturers of brown canvas leggings, similar to those worn by some of the United States Army men or militia, with a view to having them adopted by the authorities for prison use. It is also desired that samples of these articles be forwarded with the quotations. In applying to the Bureau of Manufactures, Washington, D, C., refer to file No. 7801.

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

(Special Correspondence.)

Southern manufacturers and buyers have swapped places during the past two months, and today the manufacturers are naming prices and contracts, instead of the buyer, as heretofore. Conditions are the brightest possible for Southern mills, and most of them are now so well sold ahead that they are not at all anxious to take orders for immediate delivery. In fact, it is practically impossible for buyers to fill an immediate need without a considerable increase in the price paid, and many who did not cover their requirements a month or six weeks ago, when prices were considerably lower than now, regret the fact.

The future seems to hold out better prospects in the way of prices, and manufacturers look forward to even better conditions than now exist. Prices in the yarns, cloth and knit goods markets are still on an upward trend, and buyers are glad enough to get orders filled within a reasonable length of time at present price levels.

The manufacturers are doing what was advised during the latter part of last year, in that they are sticking to the prices which they named when considering contracts. Much of the conditions existing before might have been alleviated had the manufacturer taken this into consideration, and not been so anxious to stock his mill up with any kind of orders. The difference is quite apparent and the results are not only that the mills are supplied with plenty of orders, but they are not taking orders which do not show a good margin of profit. Many of them are now willing to curtail production rather than take an order at a price which does not show a good profit, but such is not likely to prove necessary any time soon.

Export trade has livened up to a considerable degree, especially the Manchurian market. During the time the war was on in China many orders placed with Southern mills were cancelled, and prospects for an improvement were blue. The end of the war, however, has come quicker than was expected by many, and there has been a rush to stock up the depleted shelves of the merchants. The mills in South Carolina are benefitted very much by this improvement and are now sold ahead in this market.

Prices in the New York market are constantly moving upward. The greatest improvement noted in any line is on nine-ounce denims, which since the first of the year, have moved from 12¼ to 16 cents. Four-yard gray goods, fine dress ginghams and cambrics, have also witnessed much improvement. Prices on raw stock have also gone up though not in proportion to prices on yarns and cloth. Cotton on the Charlotte market is now one hundred points higher than this time last month, and eighty points higher on the New York market. Southern two-ply skeins have shown an improvement in price of about two cents during February, which might be also stated as practically the same condition on all grades of Southern yarns.

The above improvements in market conditions are seeing their effect in Southern mill construction, and many old mills are adding new equipment, and new machinery, while a great many of the mills which have not heretofore been run successfully, are being taken over by manufacturers, to be reorganized and run on a paying basis. There have been three cases of receivership during February, though only in one of the instances was same due to failure of the mill to make money. The Rhode Island Cotton Mill, and Spray Woolen Mills, of Spray, N. C., operated by the American Warehouse Company, were thrown into receivership by litigation on the American Warehouse Co. The mills, however, are in good condition, and will be operated still. The Grace Mill, of Salisbury, N. C., owing to bad management, and trouble with commission men, was obliged to sell. The Gilreath Mfg. Co., of Greenville, S. C., are now before the courts in that State in an effort to show that they are solvent, and able to meet their obligations.

There have been several reorganizations, tending to an increase in Southern production. Among these may be stated the Ridgeview Cotton Mill, of Newton, N. C., which has been purchased by W. H. Shuford, of Hickory, N. C. Machinery will be installed and the mill operated within a short while. The old Ellawhite Mills at Uniontown, Ala., have been reorganized and are now known as the Canebrake Mills. The Georgia Cotton Mills, a reorganization of the three bankrupt mills at Griffin, Ga., have completed their reorganization plans. The Bladenboro Cotton Mills, at Bladenboro, N. C., have also completed organization. Chadwick Hoskins Mill No. 5, at Pineville, N. C., which has been closed down for about five months, has commenced operations. The Buffalo Mills, near Shelby, N. C., havs been reorganized and will start shortly.

There was a proposition on foot at Aiken, S. C., tending to a combination of the Aiken, Langley and Seminole Manufacturing Companies, but owing to the fact that many of the small stockholders did not desire the combination, this plan was abandoned. The Oakland Mills, at Newberry, S. C., which have been under construction for some time and which will be numbered with the large mills of that State, has been finally started on full time. The Trollingwood Mills, at Haw River, N. C., have been bought by Graham, N. C., capitalists, and will be operated in conjunction with the mills at that place under the same control. The Franklin Mills, of Concord, N. C., have also announced a large addition to their plant at this place, and construction on the new addition will be begun in a short time. This mill is owned and operated by J. W. Cannon, who owns stock in about twenty Carolina mills, controlling a number of them.

The Thayer Mfg. Co., which is organized and will be built largely by New England capitalists, has decided on Charlotte for its location and has purchased a site just outside the corporate limits, where it will have access to both railroad and interurban transportation facilities.

It is reported that a yarn mill will be built at High Point, N. C. New England capital is interested in a proposition with Nashville, Tenn., business men looking to the establishment of a large mill at Nashville. The mill, when built, will probably be capitalized at $1,000,000. Many mills in the South changed selling agencies during February.

A meeting of the Hard Yarn Spinners' association was held at Gastonia, N. C., during the first week of February.

This association was organized about three years ago but for some reason it never proved very successful, and members seemed to lack confidence in each other, for which reasons any combined action on their part was impossible. The meeting at Gastonia was for the purpose of reorganizing this dead body and getting an agreement between its members to work together on a mutual selling policy. Though no particulars of the meeting have been given out, it is pretty well understood that this was the matter that was discussed at this last session. W. D. Moore, of Yorkville, S. C., who has been most active in the reorganization, was elected president. T. W. Crews was re-elected secretary and treasurer.

It is understood that arrangements have been made by which the Clinchfield Coal Company will supply the cotton mills of North and South Carolina with 500,000 tons of coal. A report from Bristol, Tenn., states that the Clinchfield Company has just been awarded the contract to supply 6,000 solid carloads of coal to South Carolina mills. While individual contracts have not all been made with mills of the two States, it is customary to follow the recommendations of the committees of the Cotton Manufacturers' associations, and it is believed this concern will supply practically all the coal used by mills in the Carolinas. It has been impossible to ascertain the price paid, but it is reported that reductions were offered over market quotations, which are higher than was the case last year. The Clinchfield Company supplied mills represented by the associations in the two States last year, but it is understood that a larger amount of coal will be bought this year, since several big mills which did not buy last year will likely come in, including the Parker Corporation.

NEW ENGLAND MILL SITUATION.

(Special Correspondence.)

The steady measure of improvement in mill and market conditions noted in January was continued during the past month. The gain has been very appreciable in the fine goods end of the industry, and while it is still very far from being on a generally profitable basis, the cleaning up of many stocks has paved the way for progress of a substantial character.

The labor situation is a somewhat uncertain one. The Lawrence strike developed into a very serious matter as the news reports have shown, and many minor evidences of unrest were seen in different sections. It is believed that the promise of steadier work will do much toward eliminating one source of trouble, and that promise is contained in the generally improved market conditions. The reduction in pay following the reduction in hours in Massachusetts will probably provoke a demand for a restoration as soon as business conditions seem to warrant a demand from the operatives.

One of the most encouraging features in the labor phase of the industry is the recognition by manufacturers and trades-unionists that Socialism is a force of disorder that will have to be controlled at its inception. New England has been disposed to deal leniently with various manifestations of this form of industrial revolution, but the experience at Lawrence has roused the sober thinking people to a point where industrial socialism has become a common foe, and as such, it is now recognized by leaders of manufacturing and the leaders of the old established unions.

The maintained price of raw cotton has been an influence in forcing an advance in cloth prices. The demand has been steadier and the mills have been able to sell ahead and provide for steadier operations. Advances have not been radical and they have seldom been made by agents until every possible test has been applied that would indicate the possibility of firmness. The mills as a rule have not bought cotton for the whole season. They are finding difficulty in securing good spinning grades at prices in keeping with exchange quotations.

Branded brown sheetings and drills are full ¼ cent higher than they were at the opening of the month, Pepperell standard drills now being quoted at 7¾ cents, and most grades of 4-yard sheetings at 5¾ cents. Crashes have been advanced ¼ cent. All lines of heavy colored cottons, such as cheviots, fancy duck, denims, etc., are from ¾ cent to ½ cent a yard higher and the mills have business booked that will care for their product up to June. Staple tickings are very well under order and while 8-ounce standards are still quoted at 12½ cents, it is not possible to secure many of the fancy lines on this basis.

The leading napped goods mills have booked a firm business for the balance of the half year. Some lines of goods are sold ahead into September. The leading cotton blanket mills are very well provided with business and two of them are not open to take further orders for delivery before August. Canton flannels have been sold to China and liberal domestic orders have been placed that will take care of the output for five months. Domets, mottled flannels, and flannellettes have been well sold in the better grades, and while profits will be small the prospects that a full production will be disposed of this year are good.

Print cloths and convertibles have been selling in excess of production and stocks in mill hands are very light. Standard print cloths are higher at 3¼ cents; wide goods at 4½ cents; 4-yard 80 squares at 6¼ cents; and so on through the list of odd constructions. Fall River is very comfortably sold through March and will accumulate no goods in April if an ordinary demand continues. Sateens and twills are in good shape for two months to come.

Fine plain goods have been bought liberally by some factors. Advances from the extreme low points are reorded, varying from ¼ to ¾ cent a yard. Many cloths that had accumulated at the mills were sold at low figures to clean up and some contracts have been placed in volume to run from April to September, and July to January. It is recognized that with the new and enlarged power of production improvement in this quarter is certain to be slow, but it seems to be the concensus of manufacturing opinion that the corner has been turned. The demand for many fancy goods has broadened slowly and many fall contracts have been placed on heavy fine cottons.

Many stocks of silks and cottons that clogged the markets were sacrificed during the month. These goods were greatly over-produced in the poorer grades and stocks of light weight plain goods, dobby figures, and jacquards, were offered out for what they would bring. Following this cleanup, regular handlers of the goods began to place small contracts for future delivery, and many novelties for dress purposes are now being brought out, with every promise that an improvement in consumptive demand will be stimulated.

Business in staple prints has been very steady and the printers are moderately busy, and behindhand with several styles. The sales from week to week have been in excess of production, but no advances have yet been made. Shirt-

ings have sold very well at the low price named last month and the business in percale has been large. The export trade in prints continues steady and large. Fine fancy prints did not begin to move until the last week or ten days of the month. Buyers were of the opinion that they would secure these goods at their own figures and they deferred operations until goods were actually needed for sale. Pacific lines and Arnold lines of fine fancies have taken a decided uplift in demand in the past week.

Bleached cottons have hardened steadily. At the present time Fruits and Lonsdales are at value, Fruits being quoted at 7¾ cents. The well known branded goods are under order for fully four weeks to come and many of the unbranded goods are well sold. The bleacheries have been busy all the month on quick goods and they are behind on many orders. Longcloths, nainsooks, fine lawns, and fine cambrics, have been selling steadily to jobbers and cutters.

Wide sheetings were advanced 1 cent a yard, based on 10-4 goods. The leading brands are very well under order. Indeed, the best known brands are engaged for ten weeks ahead with little promise that small orders can be handled in the meantime. Pillow tubings of the better grades are now sold ahead for three months. The sheet and pillow case trade has been broad and active. The demand is increasing for the better grades and for embroidered lines brought out in the past two years.

The gingham business has improved but it is still behind the records of two years ago. Nearly all the leading manufacturers are offering fall lines of dress ginghams, showing that their spring product was not as well carried over as last year. The closing of the Everett mills at Lawrence on account of the strike has lessened the output very materially and buyers as a whole do not appreciate the lessened gingham production of the past nine or ten months. This was strikingly illustrated in the case of staple ginghams. It was expected that when print prices were dropped to 4¾ cents, and when shirting prints were reduced ¼ cent a yard, staple ginghams would follow. But no change was made and buyers who were holding off suddenly found that the mills were not accumulating staples. This led to the placing of orders actively and at the present time the leading mills are comfortably fixed on staple ginghams for the next two months.

There is an increasing demand for the finer grades of ginghams at the retail counters and also for the fine qualities of plaids. Trade in the low priced wide zephyrs has not been as good as in recent years, but the 32-inch ginghams for 10-cent retail purposes have sold freely.

In fine fancy cottons, the large sellers have been piques, welts, fancy silk striped poplins, ratines, soisettes, and fancy prints. There has been a steady business in corded fabrics of various descriptions, including many colored cords for dress and shirting purposes. Cream serges in mercerized cottons have proved good, and there is a broadening demand for novelties in heavy silks and cottons. The usual volume of business in printed lawns, organdies, fine dimities, etc., has come slowly. There has been a distinct improvement of late in the call for quilts, and semi-staple white goods in checks and stripes.

While the measure of improvement in all lines has been positive, manufacturers are not sanguine of broad activity for some time to come. The strong feature with most of them is the fact that retailers need goods so generally that every movement in retail trade is quickly reflected back to primary circles. At the same time they recognize the difficulty of securing profitable prices while the general business of the country is affected by uncertainties in politics and finance.

The month was characterized by the publication of many important financial statements of mill conditions. The long era of high cotton caused many great losses that are now being shown, and the wide reduction of surplus accounts is a pretty safe guarantee that mills will not go on accepting business at a loss. Mill stocks have held up remarkably well and are still moderately attractive to investors. Few stocks are offered in blocks and brokers declare that they have never known a period of depression during which so few shares were sacrificed.

The bleacheries, finishing works, and machine shops are much busier. The finishers and bleachers are naturally being rushed for quick deliveries of goods that have been held back awaiting specifications. The heavier goods are wanted promptly and the novelties are behind-hand in delivery. Most of the leading machinery manufacturers are resigned to a quiet year pending action on the steel and other tariff questions, but they are very much more hopeful of trade than they were a month ago.

MONTHLY REVIEW OF THE COTTON MARKET.

(*Contributed Exclusively to* COTTON.)

BY H. AND B. BEER, NEW ORLEANS.

In our last review of the 25th ultimo we commented upon the remarkable strength displayed by the market in the face of so large an American crop, about 16,000,000 bales. In the meantime the market has advanced an additional one cent, making a rise of about $10 per bale since the government estimated the crop at less than 15,000,000 last December.

The improvement has been due to the circulating of reports that the crops of India and Egypt would be 1,000,000 bales less than last season, and because of fear of the buying power of the American speculative public. But the buying, strange to say, has been done principally for account of European spinners and importers, especially for those of the Continent and Japan, as the American mills have only taken to date about as much as they took to even date one year ago, the Northern mills have taken 1,630,000 bales, against 1,691,000 last year, Southern mills 1,630,000 vs. 1,459,000. Thus far this season exports to Europe are as much as for the whole of last season, 7,605,000 bales, against 7,603,000. In other words Europe has taken during the first six months of this season, as much cotton as Europe took during the twelve months of last season, and 1,400.000 bales more than during the twelve months of year before last. It is evident, therefore, that Europe has already taken very large quantities of American cotton for future requirements, and it is reasonable to expect that the demand for export in the future will not be so large comparatively as in the past.

Instead of the Indian crop being 1,000,000 bales smaller than one year ago, receipts at Bombay to date are actually larger than for the corresponding time last year, 1,276,000 bales, against 1,241,000 bales, while arrivals at Alexandria, Egypt, to date, in bales of 500 pounds weight are only 100,000 bales behind one year ago, 1,281,000 bales vs. 1,381,000. It is plain, therefore, that the foreign crops

have been greatly underestimated, and that the late advance in the staple was brought about by what appears to have been a scare, more than by legitimate conditions.

It follows that when the situation is carefully surveyed that spinners of Europe will realize that they have been in error as to the shortage in foreign crops, and as the American crop promises to fulfill the largest of estimates, that they will follow in the footsteps of their American brethren and buy from hand to mouth in the future, as spinners stocks the world over, excepting New England, are large, the world's takings of American cotton to date amounting to 8,605,000 bales, against 7,294,000 one year ago, or 1,311,000 bales larger, the world's visible supply of all kinds is of record proportions by more than 500,000 bales, and is 1,080,000 bales more than last year, figuring 5,993,000 vs. 4,913,000 bales. These statistics would afford more than a full supply in themselves for the balance of the season, but the South has an additional 1,500,000 bales more than one year ago to market during the remainder of the season. Under the circumstances the visible and invisible to carry over at the close of next August will probably be about 4,500,000 bales compared with only 2,000,000 bales last year. Today the world's visible supply is as follows:

Year—	1912	1911	1910
American	4,825,000	3,795,000	3,286,000
Other kinds	1,169,000	1,118,000	1,322,000
Total all kinds	5,994,000	4,913,000	4,608,000

As regards prospects for the new crop, the season is a little backward, especially east of the Mississippi river, due to the severe wet winter, but the outlook was never more promising in the Southwest, Texas and Oklahoma having had an abundance of rainfall, which has put a good season in the ground. Planting does not commence in the central belt until the middle of March, in the South Atlantics not until April 1st, consequently there is plenty of time to prepare the land for the next crop in those sections. In Texas and Oklahoma conditions are in tip top shape, and with favorable weather from now on planting will soon become general, and satisfactory germination of the seed, followed by good stands, something not heard of in the West for a number of years, will be the result, which should provide new bales in June and cotton in volume in August, whereas there is enough of the old crop to last until next November.

The 1911-12 crop of cotton in northwest India is estimated at about 400,000 bales, equally divided between Sind and Punjab. The yield for the 1910-11 season, closing September 30, was 406,000 bales, of which about 165,000 were from Sind, the balance from the Punjab. About 110,000 bales were the best quality. Prices were high during the year, averaging about 12½ cents per pound, largely on account of the shortage in the United States. Toward the last of the season there was a sharp break, however, values declining about 2 cents per pound.

The local consumption for the past season was 10,000 bales, while the shipments totaled 414,368 bales, their destinations being as follows: Bombay, 166,366; Liiverpool, 7,108; Antwerp, 70,930; Ghent, 1,172; Hamburg, 94,300; Bremen, 9,106; Dunkirk, 1,164; Havre, 224; Marseille, 2,204; Barcelona, 12,819; Genoa, 8,568; Naples, 100; Venice, 17,294; Trieste, 17,650; Maestre, 600; Ancona, 400; Fiume, 2,713; New York, 750; Portugal, 50; Christiania, 25; Waldberg, 550; Gothenburg, 275.

THE YARN MARKET.

During the past month quotations for cotton yarns have been growing stronger all the time. Regardless of the fact of whether many yarns were sold or whether any sales were made, spinners prices were still maintained at a point which would allow some real profit to the manufacturer. Mill conditions were undeniably better than for some time past, and it now seems very probable that unless some serious tariff cloud should arise in Congress, that 1912 will prove a fairly profitable year for spinners.

In the early part of the month while weaving yarns were in much better demand than yarns for hosiery, the spinners seemed to show increased independence and their decided intention to get what they asked for their products or not to sell the products. Carded yarns were firmer and the best qualities of combed cotton yarns also hardened in price to some extent. The knit goods situation showed improvements and some small orders were put through to the account of knitters. The sentiment among the dealers at this period of the month was generally bullish and it is generally conceded that lower prices cannot be expected before the first of May. There was an extreme scarcity of Southern yarns for prompt delivery, and many Southern manufacturers absolutely refused to take orders for future delivery at the prices buyers were willing to quote.

The middle of the month indicated beyond a question that yarns were firmer because the demand had broadened. There was a specially strong demand for coarse twisted stock while Sea Island was strong at an advance of several cents. There was a generally marked improvement in conditions. There was at this period a good demand also for yarns from the thread and automobile tire makers as well as from the mercerizers and manufacturers of electrical products. The knitters were not an active factor in the market during this period and many of them said that they were not able to get values for their goods that would harmonize with the prices placed on yarns by the spinners. Many buyers indicated their belief that they might have delayed too long in covering their future requirements and might not only have to pay higher prices, but also to take a considerable chance in getting the deliveries they wanted. Prices on raw cotton stiffened up considerably during this period and this fact gave the spinners cause for increasing their prices a limited extent also. Weaving yarns were in active demand for spot and quick deliveries and while the lots sold were small, those in need of the yarns paid the price.

The latter part of the month finds yarn prices still at a high level and the spinner very independent. Naturally this would be the case, as every condition affecting raw cotton would seem to warrant the prophecy that higher prices will obtain. The scarcity of long staple cotton is rather a feature on the market and there is much speculation as to what cotton prices are to do in the future. The general opinion prevails among many conservative dealers and spinners that prices are near the bottom and they are reluctant sellers at the figures generally offered. Their own prices are somewhat higher than the market offers and there seems to be no great anxiety for contracts for the latter part of the year unless higher values can be obtained. Many mills that are well sold up have advanced their quotations and taking all conditions under advisement the spinners practically control the situation. Southern frame cones are being firmly held and Southern two-ply combed peelers are

practically the only Southern yarns in the market which have not advanced in proportion of the rest of the market. As predicted above, unless the tariff board sends in a very adverse report on Schedule I and this report is promptly acted upon by Congress in a manner detrimental to cotton manufacturers, the outlook for the balance of 1912 is exceedingly optimistic.

The following are the New York quotations at the close of the month:

SOUTHERN SINGLE SKEINS.

4s to 8s	16½@17	20s	19 @19½
10s to 12s	17 @17½	24s	20 @--
14s	18 @--	30s	22½@23
18s	18½@--	40s	@28

SOUTHERN TWO-PLY SKEINS.

4s to 8s	16½@17	36s	28 @29
10s to 12s	18 @18½	40s	29 @30
14s	18½@19	50s	34 @--
16s	19 @--	60s	44 @--
20s	20½@21	3-ply 8s uphol-	
24s	22 @--	stery	17½@--
26s	22½@--	4-ply 8s uphol-	
30s	23½@24	stery	17½@--

SOUTHERN SINGLE CHAIN WARPS.

10s to 12s	18 @18½	24s	21 @--
14s	18½@19	26s	21½@--
16s	19 @19½	30s	22½@23
20s	19 @19½	40s	29 @30
22s	19½@20		

SOUTHERN TWO-PLY CHAIN WARPS.

8s to 10s	17 @18	26s	22½@23
12s to 14s	18½@19	30s	24½@--
16s	19 @19½	40s	29 @30
20s	20½@21	50s	34 @35
24s	22 @--		

SOUTHERN PEELER FRAME CONES.

8s	17¼@--	18s	18¾@19
10s	17½@--	20s	19½@--
11s	17¾@--	22s	20 @--
12s	18 @--	24s	20½@--
14s	18½@--	26s	21¼@--
16s	18¾@--	30s	22 @--

THE KNIT GOODS MARKET.

The underwear situation during the past month has been growing steadily stronger and underwear manufacturers all over the country are gaining confidence daily. Price advances are fairly general and include nearly all lines. Spring deliveries are backward, particularly on late orders, but the rising market is producing good results and the general improvement in business all over the country is stimulating buying. The hosiery situation cannot be said to be as good as that of the underwear market. Particularly is this true of the heavyweight hosiery market. The lightweight hosiery situation is considerably better and indeed in some sections is looking decidedly bright.

The early period of the month found the hosiery situation not satisfactory when judged by previous standards. Spring duplicate business was light, but at that time was expected to be better. The fact that raw silk began to advance in price produced the general feeling that mercerized cottons and lisles would be handled more successfully during the present season than for some time past. The underwear section of the market while comparatively busy, was principally occupied by the purchase of small lots. There were a few fairly good orders for light weights, but the improvement in this demand was not general.

As the month wore on the underwear market seemed to slacken temporarily, although standard lines were not so badly hit as were some of the specialties. The cheaper grades of ladies' ribbed goods has been moving to quite an appreciable degree and has caused considerable dissatisfaction among the manufacturers of ribbed goods to retail at 50 cents. The hosiery market began to show life at about this period of the month and it became evident that retailers in general were realizing the short sightedness of operating on a very small stock basis, and many of them have already started to operate on more extended lines. There has been some fears expressed that the Lawrence strike might eventually lead up to labor troubles in other sections of New England, but it is daily becoming more evident that if the Lawrence authoritives will only keep the imported socialist agitators from displaying their artistic hot air work outside of the prison walls, that very little future trouble may be looked for. Manufacturers of full fashioned goods were doing a fair business at this period of the month, but seamless hosiery manufacturers generally needed more business. So far, artificial silk goods have not proven very satisfactory and with the increasing price of raw silks, it is very probable that there will be a smaller demand in the months to come for these products than has been indicated during the past season or two.

As the month closed the hosiery situation seems to be continually improving, although the volume of business placed is rather small as compared with that of other seasons. There is considerable Southern buying in the market at the present time and from the class of material which they are purchasing, it is becoming more and more evident how difficult it is for manufacturers to find a market for poorly made or inferior products in these lines. Considerable discussion has been going on through the medium of the textile press and the daily papers concerning the validity and scope of a patent involved in the discussion about the Klosed-Krotch union suits. We thought that as this might be of interest to our readers, particularly if we could get something for them authoritative in regard to the patent, we therefore took up the subject with the patentees in order to get at this matter from their view point.

The patentees of the new Klosed-Krotch union suit state that they were surprised at the tremendous demand for a practical, convenient closed-crotch suit, though they had, of course, realized the objectionable features of the uncomfortable open-crotch suit, and the inconvenient drop-seat suit. The success of the new patented suit with the opening running down into one leg and with a permanently closed crotch was so immediate that within the first year it was noted that there was hardly a union suit to be found on the market that did not claim to be a closed crotch suit. Some of them were sewed together, some of them were buttoned together, and some of them lapped together.

The patented suit which has the opening running down into one leg is so convenient, and at the same time, so simple, that it is impossible to mistake it for any of the old style garments, and it has been a source of wonder among those who have seen it that it was not thought of sooner. The great demand for the Klosed-Krotch union suit it is claimed far exceeds the capacity of the patentees to produce the new garment, for which reason, they deemed it advisable to license certain other factories to take care of the overflow of trade. The licensees under this patent, which is No. 973,200, are required to put a woven label on each garment, bearing the patent date, October 18th, 1910. All such patented suits bear a label with that date.

Canadian imports for the six months ending September 30 totaled $258,406,094 and exports $129,606,982, increases of $35,000,000 and $2,280,000, respectively, over the same period last year.

COTTON MANUFACTURING.

SCIENTIFIC INSTRUMENTS FOR TESTING TEXTILES.

BY J. H. LESTER, M. SC.

For the purposes of this paper the term "scientific instrument" will be used as applying to instruments which will be considered to eliminate as far as possible what is known as the personal error; which are capable of standardization, and which admit of accurate results being obtained from material of widely-varying character. In short, a scientific instrument should give results which are absolute, not merely comparative. The scope of the inquiry will be limited to the consideration of appliances used in ascertaining the simplest physical characteristics of textiles, covering only the measurements of length, weight, width, and strength. Instruments or "testing machines" are in common use for these purposes, and it is intended to point out how far they may be considered to be scientific instruments, and to suggest means whereby improvement may be effected in that direction.

We may first consider the machines in common use for testing length. They are the wrap reel for yarn, the template, the plating machine, the hooking frame, and the yard-stick for cloth. All these machines are satisfactory as length-testing machines, pure and simple for inelastic material, since there is no difficulty in making each of them sufficiently accurate for their purpose in respect of the units of length they all involve. Since, however, all textiles are far from inelastic, it is sufficiently obvious that provision should be made in every case to counteract or to control this source of error. In a report the writer dealt at some length with the measurement of cotton yarn, and suggested standards of tension for cotton yarn. He also constructed a wrap reel capable of measuring yarn under the prescribed conditions, and he suggests that although in its present form this is costly and rather complicated, it may be considered to rank as a scientific instrument capable of giving the accuracy necessary for all technical research dealing with the length of yarn.

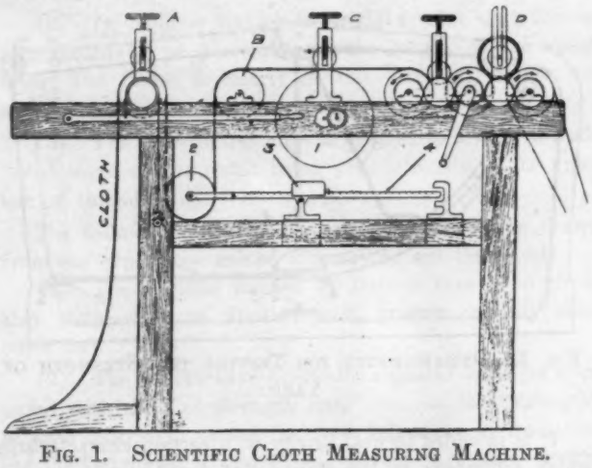


FIG. 1. SCIENTIFIC CLOTH MEASURING MACHINE.

In the cloth measuring machine illustrated in Fig. 1, the same principles have been applied, and it is the aim to measure the cloth for both scientific and commercial purposes under a definite tension suitably adapted to the particular material to be employed. It will be convenient to express this tension in terms of the weight of, say, 10 or 50 times the weight of one yard. This method of expression adapts itself at once to variation in the width and in the weight of the cloth. Incidentally, the method roughly adapts itself to variation in thickness and coarseness of the cloth in their relation to tension. The machine involves the provision of devices (1) for producing hand-controlled tension on the cloth as it comes from the roll or pile, shown at A; (2) for indicating the degree of tension so produced, shown at B; (3) for measuring the cloth whilst maintaining that tension, shown at C; and (4) for taking up the cloth into a roll or pile without greatly altering the tension undergone whilst measuring, shown at D.

The tension-indicating device B alone requires explanation. Before reaching the measuring drum the cloth is carried beneath a roller 2, which can be weighted to any desired extent by means of a running counterpoise 3 sliding upon the frame 4 which carries the roller 2. It will be clear from the drawing that the roller 2 may be weighted from zero upwards, the weight being indicated in pounds on a scale. Let us suppose, for example, that a piece of cloth is to be measured, of which the weight is eight ounces per yard, and that our standard of tension requires that a tension equal to the weight of 10 yards is to be adopted at the moment of measuring. The counterpoise 3 must be adjusted to give the tension roll a weight of 10 pounds, since under these conditions we shall produce standard tension in the cloth on each side of the roller; the cloth is entered to the machine and carried through the nip of the measuring drum 1, when the recording finger will commence to move from zero, and the cloth is then grasped by the take-up device, operated either by hand or power. The band brake is operated by hand, so that the tension-indicating roller 2 remains balanced. Any rise or fall of the indicating roller must be met with less or more brake pressure, so that the tension may be as nearly constant as possible from start to finish. This method of treatment works easily in practice as applied to yarn in the standard wrap reel, and there can be little, if any, more difficulty with cloth. The real need for such an appliance in the testing house and in the industry need not be insisted upon here, and for elastic fabrics such as crepe and stockinette it would appear to be a necessity.

As regards both twist and strength-testing machines, it is clear that accuracy of length measurement is of some consequence, and indeed is essential when the extension of the sample is to be observed. It is obviously unscientific at least to carefully record extension measurements to an accuracy of one millimetre, whilst the errors due to variation in initial tension may amount, as they commonly do, to five times that unit. At my suggestion, some makers have attempted to standardize length in these machines, but so far they are not to be greatly complimented upon their success. The illustration Fig. 2 shows in diagrammatic form how the tension may be properly obtained and expressed. The quadrant 1 being rigidly attached to the moving carriage 2, the thread 3 being tested is fixed in

the clamp 4, the other extremity being fastened to its clip at the other end of the machine after giving the thread just so much tension as will raise the quadrant weight up to the position necessary to give the standard tension already adopted as suitable for the particular count of thread. The large thumb-screw 5 is then clamped upon the thread. The scale on the quadrant may be engraved to read in counts direct.

But little need be said of the several weight-testing machines in use, for it is already generally recognized that a delicate balance may now be obtained so cheaply that the quadrant and the spiral spring type of balance must take place as being merely convenient for mill purposes and as not pretending to accuracy. Though it is doubtful whether encouragement should be given to the quadrant type of balance in view of the very great superiority of what may be called the analytical type, reference may be made to a modification of the quadrant balance made by

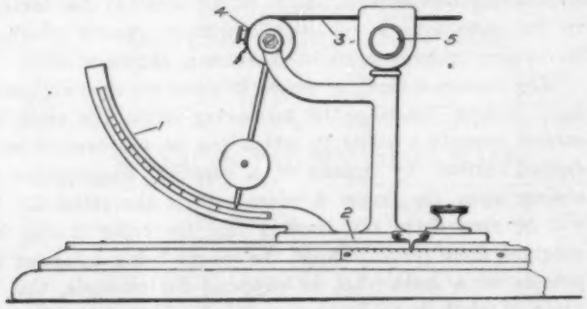


Fig. 2. Yarn Tension Indicating Instrument.

the writer for the purpose of a direct-reading hygrometer carrying wool or cotton of known dry weight. The modification consists in extending the usual quadrant upwards so as to form an almost complete semi-circle. The advantage over the existing instrument as applied to the estimation of count of yarn lies in the greater openness of scale at or about the point or range required. Thus, if the balance is constructed for testing yarn of about 36's counts, this figure will be engraved half-way up the scale, in which position the balance is most sensitive. The readings at each end of the scale are somewhat close together, and are therefore least reliable, whilst the readings near 36 are most widely separated and accurate.

The width of cloth is a measurement which should, of course, be dealt with in a similar manner to that of length; that is to say, standards should be set up and an instrument devised to apply a standard degree of tension, but it is not intended to deal with this subject here. Nor has any particular instrument been devised, to the writer's knowledge, for the purpose of measuring the width or thickness of yarn, and since the variation in this respect is of very serious commercial importance, we may give a moment's consideration to this matter. There is no doubt that variation in thickness is generally accompanied by variation in count and strength, but the apparent ease with which numerous measurements of diameter could be made in reasonable time certainly encourages the attempt to devise an automatic machine, if it can be done without excessive complication. The writer's contribution to this object is not yet far enough advanced for publication.

Much attention has been devoted by inventors, more especially during the past few years, to strength-testing machines for yarn and cloth. Almost without exception, however, the quadrant balance or the spiral spring have been pressed into service, but the instruments suffer from the drawbacks inherent to these devices. The unreliable nature of springs is well known when used for purposes of weighing over anything but a confined range, whilst no designer of a strength-testing machine built on the quadrant principle has succeeded in producing an instrument which is capable of giving either a constant rate of elongation to the sample or of adding the load at a constant rate. The necessity of providing ourselves with such constant-rate instruments for scientific purposes becomes apparent when we consider the very different treatment dealt out by existing machines to extensible and inextensible specimens. The yarn and cloth testing machines made by G. R. Smith a few years ago could be used as constant-rate machines, but users generally found them unpleasant to work with on account of the drippings of water which seemed to be an unavoidable accompaniment to their use. It is somewhat surprising to find that the testing machine which has best succeeded in practice in carrying out the principle of adding the load at a constant rate, is used for testing an inelastic material. This is the Ades machine, used most extensively in this country for cement testing. The load is added by causing a weight to travel from the fulcrum to the end of a steelyard, the beam being graduated to indicate the weight carried. The regulation of speed is obtained by means of a piston moving in an oil cylinder; in this case the speed is actually constant because the load on the piston is constant, whereas the oil cylinder arrangements well known in yarn-testing machines seldom or never give a constant speed, because the load varies.

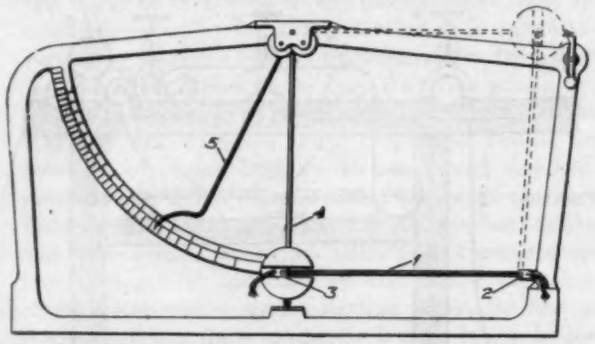


Fig. 3. Dynamometer for Testing the Strength of Yarn.

It is intended to deal briefly with certain characteristics which contribute to the strength of textiles, and particularly with an instrument designed for the purpose of ascertaining the amount of work done in breakage.

As will be seen from the illustration of the dynamometer, Fig. 3, the specimen 1 is first gripped between clips 2 and 3 at opposite ends, any desired tension being applied by slight, though definite, horizontal displacement of the pendulum bob. The pendulum 4 with its attached thread is then raised to the horizontal position, as shown in dotted lines, the thread hanging loose between the clips. On releasing the catch, the pendulum bob is free to swing downwardly, and when passing the lowest point of its swing breaks the thread. The height to which the recording finger 5 is lifted indicates the proportion of energy left in the bob after having broken the specimen. The scale is, of course, divided into equal divisions on a vertical scale, such scale being projected upon the quadrant for

convenience. It is quite clear that the result may be calculated very readily from the instrument, and may indeed be read off direct if the scale is graduated accordingly. If, for example, the pendulum bob weighs one pound and is raised one foot, we shall have the energy of one foot-pound stored up therein; if the bob rises after fracture to a point half way up the scale (vertically), the amount of work done in breaking the specimen will have been one-half foot-pound. For purposes of testing threads, the gram-centimetre, being a smaller unit, is more convenient than the foot-pound, and this unit has been employed in experiments.

A further series of tests was devoted to showing the influence of the length of specimen upon the result, and it was found that when 25c.m. was taken instead of 50c.m. the ballistic test gave an average of 1,204 grm. centimetres. If the length of specimen were directly proportionate to the amount of work done in breakage, this figure would have been, of course, 997 grm. centimetres, that is, half the figure obtained upon 50c.m. The reason for the discrepancy is not apparent.

When replacing the single thread by two or more threads, the average of numerous tests showed the result to be directly proportionate to the number of threads, no difference resulting from leaving one or more threads much slacker than the others.

The above results may be summarized thus:

(1) The ballistic test gives substantially the same figure for "work done" as the stress and strain diagram gives by calculation.

(2) In ballistic testing it would appear that the result should be proportionate to the length of the specimen. The result is clearly in this direction, but is not conclusive.

(3) The ballistic test may be applied to several threads tested together, the result being proportionate to the number of threads.

The following practical conclusions may now be drawn from the experience gained in carrying out these tests:

(1) The ballistic method of testing yarn—and probably cloth—may be applied with greater rapidity than other test.

(2) The results have a definite scientific value as compared with the "lea strength test," because the "strength" of each individual thread takes its full share in maintaining the "strength" of the whole, consequently when several threads are tested together, the true average result of the single thread is readily obtainable by division.

(3) Since the method gives proper importance to the elasticity of the sample, it indicates better than existing methods the true "strength" of the yarn, the "toughness" and the actual working quality. It gives the amount of resistance of yarn to the shocks of weaving, and it gives the resistance of cloth to those strains which most commonly cause it to fail in use.

(4) The method is definitely of a scientific character, since it compounds together the elasticity, and the load the specimen will carry into one figure, the exactly correct balance between these components being maintained.

(5) It may be confidently predicted that at some future time the ballistic method will supersede the present method for ordinary commercial purposes.

COTTON MILL MACHINERY CALCULATIONS.

A Further Discussion of Fly Frames and Their Details. The Differential Motion or Compound.

(*Contributed Exclusively to* COTTON.)

BY B. M. PARKER.

PART XIII.

The purpose of the differential motion or compound is to give a suitable means for the correct driving of the bobbins. The bobbins must revolve as fast as the spindles and enough in excess of this speed to wind on the amount of roving delivered by the front roll. As the bobbins increase in size, the number of revolutions necessary to wind on the roving decreases and consequently the bobbins must decrease in speed. This decrease in bobbin speed is obtained by automatically changing the position of the cone-belt on the cones by means of the tension gearing, giving a varying speed to the bottom cone. The compound receives this variable speed from the bottom cone, combines it with the constant speed of the main shaft and delivers it as one motion to the sleeve gear. The speed of the bobbins, due to the motion of the main shaft, considering the bottom cone as being stationery, is equal to the speed of the spindles and consequently, no winding would take place. When the bottom cone is in motion, the speed of the bobbins is greater than the speed of the spindles and the roving is being wound on the bobbins. This additional speed of the bobbins, spoken of as the excess speed of the bobbins, is due to the bottom cone speed and is necessary to produce the winding. The changing of the position of the cone belt changes the bottom cone speed and the speed of the compound, thus changing the speed of the bobbins.

The majority of American machine builders have adopted one type of compound, the old style level gear compound, a cut of which is shown in Fig. 36. Keyed on the main shaft, which carries the twist gear and the gear driving the spindles, is a bevel *A* which drives, by means of two idler gears *C* and *D*, another bevel gear *B*, this latter gear forming part of the loose or "sleeve" gear; also called the bobbin gear. This sleeve gear consists of the bevel gear *B* and the spur gear of 50 teeth, which drives direct to the bobbins, the two being joined together by a collar or sleeve, the sleeve gear has no connection whatever with the main shaft,

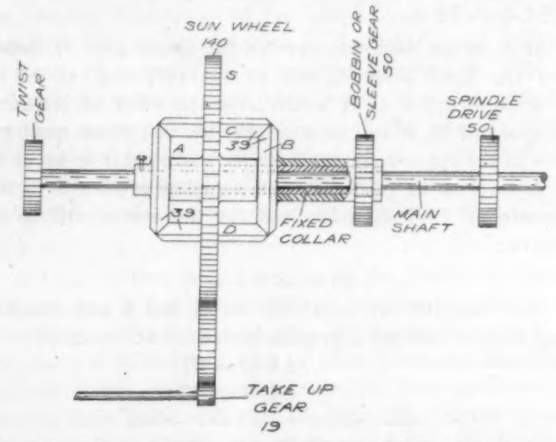


FIG. 36. THE BEVEL GEAR DIFFERENTIAL MOTION OR COMPOUND.

being carried on a fixed collar and revolving independently of the main shaft. The two idlers, *C* and *D*, serve simply to transmit motion from *A* to *B*, their axes being spokes of the sun-wheel *S* and, when *S* is revolved around the shaft *C* and *D* will revolve about the shaft with *S*. The sun-wheel revolves independently of the mainshaft on the fixed collar, being driven from the bottom cone at a variable speed. It will be seen that the final speed of the sleeve gear *B* is a combination of the fixed speed of the gear *A* and the variable speed of the gear *S*, the speed of *S* being the one that gives the excess speed to the bobbins and also the one that is varied to give the decreasing speed that is demanded by the increasing size of the bobbins while winding is taking place.

Without going into the theory underlying the construction of the compound, we can explain its action by following each motion in detail. If we revolve *A* one revolution, the carriers *C* and *D* will transmit this direct to *B* and *B* will have one revolution, the gears A, C, D, and B, having the same number of teeth. The direction of the revolution of *B* will be opposite to that of *A*. By using the signs + and — to denote the direction of revolution, we will get the following statement of the facts, it being understood that *S* is being held stationary.

A1 + B1—

If we consider A as stationary and revolve S one revolution we will get two revolutions to the bevel B. The direction of the revolutions of B will be the same as that of S. While S revolves, the idlers C and D are being carried around the shaft by S and, as they are in gear with B, B will, of necessity, be carried around the shaft in the same direction as S and will have one revolution for one of S. We can refer to this revolution as the revolving of C and D around the shaft.

While S is making one revolution and carrying the gears C and D around the shaft with it, C and D, being in contact with the fixed gear A, will have to roll around the face of A. Having the same number of teeth, this will cause C and D to revolve on their own axis and will give them one such revolution for every revolution of S. This will cause B to have one revolution and it will be in the same direction as the gear S. We can refer to this revolution as due to the revolving of C and D on their own centers, due to their contact with the gear A, while being carried around the shaft by S. Then the following statement will be in accordance with the above facts:

S1 + = B2 +

As it is the desire to revolve the sleeve gear B faster than the fixed bevel A and as the revolving of S, in the same direction as A would have the effect of reducing the speed of B, it will be seen that the sun-wheel must revolve in the opposite direction to the main shaft or bevel A. As A revolves in (+) direction we must revolve S in the opposite or (—) direction and the conditions will be as follows:

S1 — = B2 —

Now take the two equations for A and S and combine them and we will get a graphic statement of the facts:

A1 + = B1 —
S1 — = B2 —

(A1 +) + (S1 —) = B3 —

With the sun-wheel and main shaft revolving in opposite directions the speed of B is greater than A and is reduced as the speed of S is reduced. If the sun-wheel and main shaft revolve in the same direction the speed of B would be less than the speed of A and would be increased as the speed of the sun-wheel is decreased. This last condition is found in the old style flyer lead frames.

The above can be summed up in the following words: *The speed of the sleeve gear is equal to the speed of the main shaft, plus twice the speed of the sun-wheel.*

The speed of the sun-wheel is greatest at the start of a set and is decreased as the bobbin builds, due to the decrease in bottom cone speed which occurs as the cone belt is moved on the cones.

In Fig. 37 is shown a cut of the Daly differential motion used on the Woonsocket 7 by 3 inch fly frame. This motion employs spur gears and all parts revolve in the same direction, the whole being enclosed so as not to be constantly accumulating dust and fly.

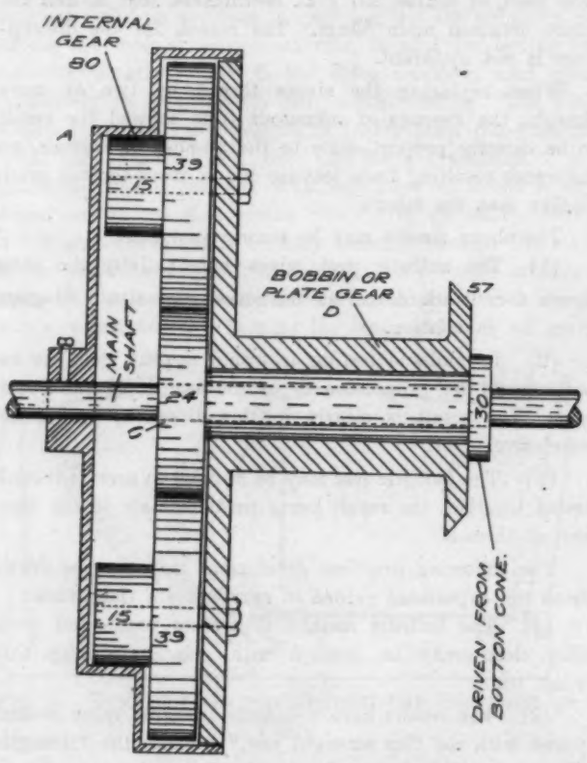


FIG. 37. DALY DIFFERENTIAL.

On the main shaft is an internal gear A of 80 teeth, driving a small gear of 15 teeth which is compounded with a gear of 39 teeth, both being carried on a stud which is fixed into the plate gear D. This plate gear also carries a bevel of 37 teeth which drives direct to the bobbins. The 39 tooth gear is in gear with the 24 tooth gear C which is on a sleeve, the other end carrying a gear of 30 teeth, this latter being driven from the bottom cone. The gears 24 and 30 are compounded together by the sleeve connecting the two, the whole being called the sleeve gear and revolves on, and in the same direction with the main shaft. The bobbin or plate gear D revolves on the collar of the sleeve gear and in the same direction as the main shaft.

As in the former case, there are two motions which are combined into one: First: The fixed constant speed of the main shaft gear A; second: the variable speed of the

sleeve gear C, which comes from the bottom cone and gives to and regulates the excess speed of the bobbins.

If we consider the effect of these two motions separately on the gear D, we will be able to understand the operation of the compound. While A is moving and C is held still, A carries the compound gears 15 and 39 around with it, because it cannot revolve on its own axis, due to the fact that the 24 and 39 tooth gears are in contact and the 24 tooth gear is stationary. While the compound gear of 15 and 39 teeth is being carried around the shaft by the movement or the gear A, the 39 tooth gear is meshing with the 24 tooth gear, which will cause the 15 and 39 tooth gear to revolve on its own axis. This action will cause a lagging behind of the gear D or a slipping ahead of the gear A. Now if A is given one complete revolution it will be seen that the gear D will not revolve a full revolution, due to the compound gear 15 and 39 revolving on its own axis caused by the 39 tooth gear rolling around the face of the stationary gear of 24 teeth and to revolve A far enough to cause a complete revolution to D, the 39 tooth gear will revolve entirely around the 24 tooth gear and make 24/39 of a revolution on its own axis, hence the 15 tooth gear compounded with the 39 tooth gear will make the same fraction of a revolution. This will cause the gear A to advance ahead of the gear D by the following fraction:

$$\frac{24}{39} \times \frac{15}{80} = .115$$

Then when A makes 1.115 revolutions, D will make 1 revolution; and while A is making 1 revolution D will make .896 of a revolution. Now if we express the speed of D, due to the speed of A, in terms of A, we get the following:

$$D = A \times .896.$$

Now take the second condition and suppose A is still and revolve C. When C is revolved the gear of 24 teeth gives motion to the 39 and the 15 tooth compound gear and cause it to revolve on its own axis. This will cause the 15 tooth gear to be moved around the internal gear A of 80 teeth and give the gear D a part of a revolution for every revolution of C, expressed by the value of the train of gearing:

$$\frac{24 \times 15}{39 \times 80} = .115$$

Then the speed of D due to the speed of C and expressed in terms of C, will be as follows:

$$D = C \times .115$$

Now combining the two speeds of D, due to the speeds of A and C, in terms of both A and C, we have:

The speed of $D = (A \times .896) + (C \times .115)$.

The value of the train of gearing between the main shaft and the spindles; and between the gear D and the bobbins, is such as to give the same speed to the spindles and bobbins when C is stationary then it will be seen that when C revolves the bobbins have a speed faster than the spindles and are winding on the roving and that, when the speed of C is reduced, the speed of the bobbins is reduced.

(To be continued.)

Women and girls employed in the manufacture of underwear and waists in Switzerland work 10 to 10½ hours a day and earn 50 cents to $1, the latter sum being paid only to a few persons of exceptional skill.

OBITUARY.

George A. Gray, Sr., president and treasurer of the Gray Manufacturing Company, one of the best known cotton goods manufacturers of the South, died at Gastonia, N. C., on February 8th, following an illness of a little more than three weeks. Very few people knew of his desperate illness, and the announcement of his death came as a distinct shock to his many friends.

Of Gastonia's eleven cotton mill corporations, he was one of the chief promoters of nine. Excepting only the Arlington and Modena mills, he had been largely responsible for the establishment of all of the mills there and had been the moving spirit that called them into existence. With the late Capt. R. C. G. Love, he was the pioneer cotton manufacturer in the town, they together having organized in 1888 the Gastonia Cotton Manufacturing Company and erected what is usually referred to locally as the "old mill." This was the forerunner of fifteen other cotton mills, operated by ten corporations.

Perhaps the most ambitious work undertaken by Mr. Gray was the promotion of the Loray mill, capitalized at $1,500,000, which he, together with his then partner, John F. Love, organized and built. This mill was named for these two men, Love and Gray. Later, Mr. Gray disposed of his interest in the Loray.

Mr. Gray organized and built the Avon mill, in 1896, which he personally superintended for several years. In 1905 he concentrated his energies largely on the Gray Manufacturing Company, of which he was president and treasurer at the time of his death. This is one of the most successful mills manufacturing fine yarns. Mr. Gray was one of the first to realize the fact that the cotton yarn spinners of the South were devoting entirely too much time to the making of the low grade yarns and were neglecting a splendid field offered for the making of the higher numbers. The Gray mill was built for the purpose of making fine yarns, and since it began operations other mills in the South have also began the manufacture of the finer counts.

H. William Nelson has recently taken charge of the weaving and designing department of the Mississippi Textile School. Mr. Nelson is especially fitted for teaching this branch of the industry as he was for ten years the head of the weaving department of the Lowell Textile School. His previous training was secured in the schools and mills of England, where stress is laid on thoroughness. In 1906, he resigned his position with the Lowell School to accept a position as superintendent of one of the large Southern mills and has been actively engaged in mill work since that time. The faculty and students of the school are to be congratulated on securing so competent an instructor.

A business firm in India writes to the Bureau of Manufactures that it has an established business as merchants', manufacturers', miners and general commission agents in that country and would like to hear from any American business houses desirous of introducing their goods or increasing their trade with that country. For further information apply to the Bureau of Manufactures, Washington, D. C., and refer to file No. 7838.

KNITTING

THE KNITTED FABRIC.

(Contributed Exclusively to COTTON.)

BY WILLIAM DAVIS, M. A.

It will be instructve to examine analytically the build of the knit fabric so that the requirements for an ideal article may be the better understood. Taking the ordinary plain loop as a starting point we recognize that it is constructed from a single thread which in the formation of the course is divided into small portions which go to form the row of loops. In some ways this single thread fabric has many drawbacks. If you break it the surrounding loops give way and a considerable imperfection results. Yet this single thread structure also accounts for its outstanding advantage, namely its extreme elasticity and stretch. It forms such a unity that any contortion is at once taken cognizance of and the surrounding portions are in a state of tension until the cause of the irregularity

FIG. A. FABRIC OF 2-PLY SPUN SILK. FACE SIDE.

is removed. The individual loop is nicely balanced above, below and on either side, so that if the equilibrium is disturbed, the adjoining sections tend to restore the equilibrium. The fabric yields readily to the ordinary stretch to which it is subjected in wear, which stretch being removed, the fabric springs back into its normal dimensions.

This holds good only within the limits of elasticity, for if the property be too frequently taken advantage of, the garment will come to assume the new shape. The extent to which this takes place depends on the nature of the material used, wool possessing considerably more elasticity than other textile fibers, such as cotton and silk. It also depends on the manner in which the thread is made up, a hard twisted yarn would not yield as readily as one of a softer type. Also combed yarns differ from carded yarns in this respect. Apart from the material, however, we are able to discover in the nature of the loop itself the conditions which must be observed that the fabric may be best constructed.

A highly magnified photo-micrograph of a 2-fold spun silk knit fabric is shown at Fig. A, which represents the right side of a knitted fabric. In the face the effect is a longitudinal one, the vertical portions of the loop being most in evidence and the horizontal or curved portions going to the back. Owing to the manner in which the thread must bend, those vertical portions give a V-shaped effect. Should this fabric be turned the structure shown at Fig. B will be noticed where the curved portions of the loop are most in evidence and constitute what one might term the horizontal elements of loop formation. These do not appear so attractive to the eye as the lengthwise portions, hence the latter is generally taken as the face of the fabric. The back may be said to be made up of a series of semicircles one row facing downwards alternating with a row facing upwards.

If the plain fabric has to possess a full and elastic handle certain conditions have to be observed. One of the most important is that the size of the thread employed must bear a certain ratio to the space allotted to it. The allotted space may be considered as the number of loops per inch which may be readily calculated from the gauge. The space is that left between sinkers and needles, and this space gradually decreases with the fineness of the frame. For the general run of spring needle frames the arrangement is needle, yarn space, sinker, yarn space.

The frequency of the needles is indicated by the gauge. Thus a 12-gauge would mean there were $12 \times 2 = 24$ needles on 3 inches which represent 8 needles per inch. Similarly an 18-gauge would have $18 \times 2 = 36$ needles on

FIG. B. THE SAME FABRIC AS A. BACK SIDE.

3 inches = 12 needles per inch. The upper semicircular portions of fabric are formed on the needles whilst the lower semicircular portions are produced by the sinkers, portions which are frequenly termed needle and sinker loops respectively. The loop is thus thoroughly controlled at every point which explains why the fabric made on the spring needle machines is of such excellence; the loops in themselves are regular and symmetrical.

Obviously the space left for the yarn depends on that taken up by the thickness of needle and breadth of the sinker, matters which vary according to the place where the machine has been made. Mechanicians differ as to the dimensions of needle and sinker for various gauges, each thinking his own arrangement best. Here I do not intend to join the cry of most other writers for a universal standard system of frame gauges and corresponding standard sinkers and needles for each. One might as well expect all nations to speak the same language as to expect them

to express their ideas of machine mechanism in exactly the same way. It is just this difficulty that prevents us drawing out definite formulae for determining the frame gauge suitable for a certain thickness of yarn, but much interesting matter may be learned by taking the needle and sinker dimensions of any given frame and seeing what space is actually available for the yarn. Next to that the diameter of the yarn used can be calculated by the customary method and the relation between the gauge of the frame and the size of the yarn calculated.

In many districts there exist a general method of determining the size of the yarn for a plain knit fabric which is to make the gauge of the frame correspond to the counts of the worsted yarn double. Thus a 20s two-fold worsted yarn would be worked on a 20 gauge frame which had $20 \times 2 = 40$ needles on 3 inches $= 13\frac{1}{3}$ stitches per inch. 30s two-fold worsted thread would be worked on a 30 gauge, equal to $30 \times 2 = 60$ needles on 3 inches $= 20$ stitches per inch.

To calculate the diameter of a yarn the general way is to extract the square root of the yards per pound and deduct a percentage according to the amount of surface fibre projecting. In woolen yarns the surface material occurs in the greatest quantity and in worsted and cotton it is much less. For woolen threads the deduction made is generally 16 per cent, with 10 per cent for cotton and worsted. This rule holds good for the yarns used in the weaving industries where the distinction between woolen and worsted is much clearer than in the knit goods industry. The results of extensive investigations on woolen and worsted knitting yarns show that the difference is more one of parallelism of fibres rather than one of projecting surface material, and worsted threads frequently project as much of this fibre as woolen threads. Further the worsted knitting yarn has less twist imparted than the worsted weaving yarn, a matter which considerably affects the diameter. All those considerations render it advisable that the minimum allowance for surface fibre and slack twist on a worsted knitting yarn should be 20 per cent when calculating the diameter.

Example. Calculate the diameter of 30s two-fold worsted knitting yarn 2 threads 30 = single 15s. $560 \times 15 = 8400$ yards per pound. Find square root of 8400. $\sqrt{8400} = 92$ approximately. Deduct 20 per cent for surface material projecting. 92 less $\frac{1}{5} = 92 - 18 = 74$ or 1/74 inch in diameter. In other words 74 ends of this yarn placed side by side would occupy one inch.

Example. Calculate diameter of 18s 2-fold worsted yarn. 2 threads 18s = single 9s. $560 \times 9 = 5040$ yards per pound. $\sqrt{5040} = 71$ approximately. Deduct 20 per cent 71 less $\frac{1}{5} = 71 - 14 = 57$ or 1/57 inch in diameter.

When calculating the actual diameter for knitting purposes, one important factor must not be overlooked and that is the diminution of thickness which the thread undergoes in the operation of sinking. The yarn is not in its natural state when pressed between the needles, but is stretched considerably, thus causing a corresponding reduction in diameter which must be allowed for in finding the counts of yarn suited to a given gauge of frame. This being so, for the following tables no deduction will be made on the yarn diameter number for surface fibre, but it will be assumed that the decrease in diameter arising from the sinking of loops is balanced by the increase of diameter due to surface fibre.

MACHINE DIMENSIONS.

To complete this discussion we must consider how the space in a knitting frame is distributed over needles, sinkers and yarn space. For accurate information the writer undertook a series of micro-measurements of needles and sinkers on knitting frames of the "Cotton's Patent" type at present in every day use which results are given in Table I. In these measurements the gauge represents the "leads" of two needles each covering 3 inches. Thus a 12 gauge frame has $12 \times 2 = 24$ needles on 3 inches $= 8$ needles per inch. 18 gauge has $18 \times 2 = 36$ needles on 3 inches $= 12$ needles per inch.

The manner in which needles and sinkers are arranged will be understood by consulting Diagram I, where N = needle and S = sinker. The space is divided up as follows: space for needle, space for yarn, space for sinker, space for yarn. The total distance is termed a needle space and is at once given for any gauge of frame; thus, 12 gauge has 8 needles per inch $= \frac{1}{8}$ inch needle space $= .125$ inch 18 gauge $= 12$ needles per inch $= 1/12$ inch needle space $= .083$ inch and so on for any given gauge.

TABLE I

1 Gauge of Frame	2 Needles per inch	3 Needle space, inch	4 Diameter of Needle	5 Thickness of sinker
7	4.6	.2174	.0950	.0391
12	8.0	.1250	.0440	.0200
16	10.6	.0943	.0395	.0160
18	12.0	.0833	.0300	.0140
20	13.3	.0751	.0275	.0130
24	16.0	.0625	.0260	.0115
30	20.0	.0500	.0205	.0075
34	22.6	.0442	.0185	.0067

From those actual measurements we are able to deduce for each gauge the proportion of space taken up by needles and sinkers, the remaining space being available for yarn.

Thus for 7 gauge: Diameter of needle ÷ needle space $= .0950 \div 2174 = .44$.

For 12 gauge Diameter needle ÷ by needle space $= 0440 \div .1250 = .35$.

Similarly can be calculated the ratio of the thickness of

TABLE II

Gauge of Frame	RATIO I: Diam. of needle / Needle space	=	Percentage of Space occupied by needle	RATIO II: Thickness of sinker / Needle space	=	Percent of Space occupied by sinker
7	.0950 / .2174	= .44	44	.0391 / .2174	= .18	18
12	.0440 / .1250	= .35	35	.0200 / .1250	= .16	16
16	.0395 / .0943	= .42	42	.0160 / .0943	= .17	17
18	.0300 / .0833	= .37	37	.0140 / .0833	= .17	17
20	.0275 / .0751	= .37	37	.0130 / .0751	= .17	17
24	.0260 / .0625	= .42	42	.0115 / .0625	= .18	18
30	.0205 / .0500	= .41	41	.0075 / .0500	= .15	15
34	.0185 / .0442	= .42	42	.0067 / .0442	= .15	15
			320			133
			Average 40 Percent			Average 16.6 Precent

sinker to the needle space. Thus for 12 gauge: Thickness of sinker ÷ needle space = .0200 ÷ .1250 = .16. In this way from the foregoing table then Table II can be made.

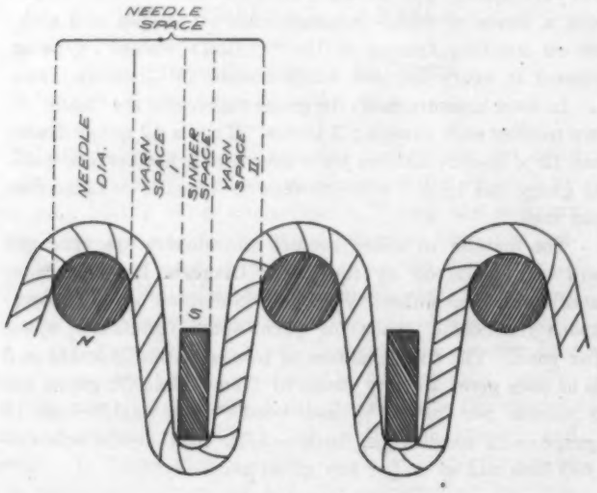


DIAGRAM I.

By taking the average of results in the last table we find that 40 per cent of the space in the frame is taken up by the needles and 16.6 per cent of the space is occupied by the sinkers. As the "needle space" is laid out: needle, yarn, sinker, yarn, the remaining percentage should be halved to find the space available for the yarn to work in:

Thus 40 + 16.6 = 56.6 per cent and 100 — 56.6 = 43.4 per cent for yarn. But this is the percentage taken up by two yarn spaces, therefore 43.4 ÷ 2 = 21.7 per cent for each yarn space.

These averages represent the conditions of present day practical work and are valuable inasmuch as we are able to calculate the space availabale for the yarn recommended for any particular gauge. Observation and calculation demonstrate clearly that for ordinary symmetrical, well balanced fabric all the space allotted to the yarn is not occupied by it. From diagram I it will be understood that the thread requires to be somewhat less than the space allowed to give it a free passage during the movements necessary to form the loops. Also the thread does not lie straight between sinker and needle, but at an angle which decreases with the length of loop drawn. To conclude the discussion, therefore, we shall compute the diameter of yarn for each of the given frame gauges and endeavor to estimate the percentage of clearance necessary for course and fine fabrics respectively.

In the subsequent tables the yarn diameters have been taken merely as the square root of the yarns per pound of the given count and it has been assumed that the decrease of diameter due to the pressure expended on the yarn in sinking is compensated for by the increase of diameter due to the presence of surface fibre.

The table has been constructed in the following manner. The yarn number has been taken as the two-fold count of the same number as the frame gauge, which is usual in practice. The diameters of each were next calculated in the manner described previously and the result expressed in decimals. Thus for the 12 gauge frame 2/12s worsted yarn is taken:

Yards per pound = 560 × 6 = 3360. $\sqrt{3360}$ = 58 = diameter = 1/58 inch = .0172 inch working the other counts out in the same way we obtain:

TABLE III

7 Gauge	=	2-7s	Worsted	.0227 inch diameter.
12 Gauge	=	2-12s	Worsted	.0172 inch diameter.
16 Gauge	=	2-16s	Worsted	.0149 inch diameter.
18 Gauge	=	2-18s	Worsted	.0143 inch diameter.
20 Gauge	=	2-20s	Worsted	.0133 inch diameter.
24 Gauge	=	2-24s	Worsted	.0122 inch diameter.
30 Gauge	=	2-30s	Worsted	.0109 inch diameter.
34 Gauge	=	2-34s	Worsted	.0102 inch diameter.

From Table I can be obtained the space taken up by sinkers and needles by adding columns 4 and 5 together and this subtracted from the "needle space" gives the space allotted to the two yarn portions, dividing this by two gives the exact space allowed for each individual thread. When this is done the diameter number is deducted from the space allotted and the clearance obtained.

TABLE IV

Gauge	Suitable Yarn Worsted	Needle Space as Table I	Needle Plus Sinker thickness Table II	Column 3 Minus Column 4 = yarn Space	Divide Column 5 by 2	Diameter of Yarns	Clearance Column 6 Minus Column 7
7	2-7s	.2174	.1341	.0833	.0416	.0227	.0189
12	2-12s	.1250	.0640	.0610	.0305	.0172	.0133
16	2-16s	.0943	.0555	.0388	.0194	.0149	.0045
18	2-18s	.0833	.0440	.0393	.0196	.0143	.0053
20	2-20s	.0751	.0405	.0346	.0173	.0133	.0040
24	2-24s	.0625	.0375	.0250	.0125	.0122	.0003
30	2-30s	.0500	.0280	.0220	.0110	.0109	.0001
34	2-34s	.0442	.0252	.0190	.0095	.0102	Negative
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8

Other writers on this subject appear to have ignored the question of yarn clearance in their calculations and have assumed that the diameter of yarn completely filled the allotted space. Table III shows that the clearance of the yarn is most necessary in coarse yarns as they create the most friction on the needles. As we approach the finer gauges the proportion of clearance becomes gradually less until in 34 gauge it becomes a negative quantity which would mean that the yarn would be subjected to pressure in passing between the frame sinkers and needles.

The late Professor Willkomn, the well known German knitting technologist undertook a series of measurements on hand stocking frames as has first been described for "Cotton's" power machine and he found that the needles occupied 50 per cent of space and the sinkers 23 per cent. Together this gives 73 per cent of space occupied by needles and sinkers, leaving 100 — 73 = 27 per cent for yarn = 13½ per cent for each individual thread. According to Table II the present measurements indicate 40 per cent space occupied by needles and 16.6 per cent by sinkers, making in all 40 + 16.6 per cent = 56.6 per cent for needles and sinkers, leaving 100 — 56.6 = 43.4 per cent space for yarn. 43.4 ÷ 2 = 21.7 per cent of space for a single yarn diameter. Thus it will be seen that the space for yarns is 21.7 — 13.5 = 8.2 per cent more than was allowed by Professor Willkomn. This is interesting as showing how frames differ in the sinker and needle dimensions according to the place where they are made.

Naturally the more space taken up by sinkers and needle means less space for the yarn and consequently a lighter fabric is produced. Thus it is that 12 gauge from one frame often handles entirely different from the same gauge in another frame. The real reason why the needle and sinker measurements vary according to the gauge is that they may be of suitable strength to resist the wearing effect

of the yarn. If 16 gauge needles and sinkers were used on a 10 gauge frame, the needles would not be strong enough to withstand the loop formation and would bend and break. The yarn also would in a short time wear grooves in the sinker and render it unfit for its function. The dimensions therefore, are generally gauged as small as are compatible with the stresses and strains to which the parts are subjected in knitting. The matter also depends ultimately on the quality of metal used, if it is of extra strength and durability, the parts can afford to be of smaller dimensions. To pursue the matter further would be to trespass on the preserves of the machine builder.

DYEING, BLEACHING AND FINISHING.

THE AFTER TREATMENT OF SULPHUR COLORS ON COTTON.

(*Contributed Exclusively to* COTTON.)

BY J. MERRITT MATTHEWS, PH. D.

AFTER TREATMENT OF BLACK DYES.

There have been numerous methods proposed for the after treatment of black sulphur dyes when applied to cotton. These methods of after-treatment have several objects in view: (1) to enhance the beauty of the color by affecting its tone; (2) to increase the fastness of the color to light and washing; (3) to complete the oxidation of the color and thus obtain the full benefit of the dyestuff in the production of the shade; (4) to obviate the harsh feel usually produced on the cotton fibre by the method of dyeing the sulphur colors; and (5) to eliminate or neutralize substances in the dyed color which may ultimately develop an acid nature and cause a tendering of the fibre.

After-treatment with Bluestone. This method of after-treatment has been proposed from time to time, chiefly with the idea of giving to the color an increased fastness to light and at the same time changing the tone of the black to a bluish cast and thus producing a richer and bloomier color. The idea of this after-treatment was no doubt derived from a similar treatment given certain substantive colors with varied degrees of success. With sulphur blacks, however, it has been shown rather conclusively that an after-treatment with bluestone not only does not bring about the results pretended, but in reality has a deleterious effect in that it produces a tendering of the cotton fibre which has been dyed with sulphur black. This is presumably caused by the fact that the metallic salt, in this instance, brings about the production of an acid compound by its reaction with the dyestuff. Concerning the idea that the use of bluestone on sulphur blacks causes the color to acquire a bluish tone, it may be said that this is chiefly imagination, the name *bluestone* suggesting psychologically the idea of *blue.* As a matter of fact, since black sulphur colors are very often dyed in iron vessels, or with the use of iron sticks, the use of copper sulphate (bluestone) in the bath causes the iron to be attacked, and as a result there is usually some oxide of iron precipitated on the fibre, which gives a misty appearance to the color. Instead of being an advantage, the use of bluestone for after-treating sulphur blacks is decidedly disadvantageous, and consequently should be avoided.

After-treatment with Chrome. As chrome is a strong oxidizing agent, its use for the after-treatment of sulphur blacks has been suggested for the purpose of completing the oxidization of the coloring matter. Its use is also supposed to yield a color which is faster to light and washing. While the oxidizing properties of chrome may have some effect in completing the fixation of the dyestuff on the fibre and thus eliminate the excess of incompletely fixed coloring matter, it is exceedingly doubtful if it really increases the true fastness of the fixed color itself. The same effect can without doubt be attained by means of a thorough washing, either with water containing a small amount of sodium sulphide or a hot soap liquor. The idea in view is really to remove from the fibre all incompletely combined coloring matter, which might be subsequently removed by a scouring operation and thus lessen the fastness of the color to washing. Very little of the dyeings made with sulphur black at the present time are treated with chrome but in the majority of cases the color is given a good soaping directly after dyeing to remove all superfluous dyestuff. The treatment with chrome has the disadvantage of giving the yarn a harsh feel, and if an excess of chrome is employed the color is apt to be changed to a brownish tone.

After-treatment with Sodium Acetate or Sodium Formate. This method of after-treatment has been highly recommended by some of the principal manufacturers of sulphur black dyes. The principal idea in this form of after-treatment appears to be that of preventing the subsequent tendering of the fibre. Nearly all sulphur black dyes appear to contain more or less free sulphur and also, probably, sulphur compounds which, on exposure to the air, gradually set free sulphur itself. The presence of this sulphur or such sulphur compounds in the fabric which has been dyed with sulphur black seems to gradually give rise to the formation of sulphuric acid. This reaction is brought about no doubt by the influence of the oxygen of the air on the sulphur. The presence of this acid, of course, leads to a tendering of the fibre. The effect of using sodium acetate or formate as an after-treatment is to leave a small quantity of these salts in the fibre and as sulphuric acid is engendered it reacts with the sodium salt to form sodium sulphate, which is a neutral substance and without injurious effect upon the material. At the same time there is also liberated either free acetic or formic acid, depending on the particular salt which was employed for the after-treatment. These free acids, however, are volatile and their presence as thus formed will not have any bad effect or tendering action on the cotton. In the treatment with sodium acetate the dyed goods are worked in a bath containing from 5 to 8 ounces of sodium acetate to each 10 gallons of liquor. The same amount of sodium formate should be employed if this salt is used in place of the acetate. This after-treatment may take place in the rinsing bath which is given the goods after being dyed.

After-treatment with alkaline substances. This method of after-treatment is one of the favorite processes for both improving the quality or tone of the color of sulphur blacks, and at the same time preventing the subsequent tendering of the fibre which has been dyed with these colors. This after-treatment usually takes place as a rinsing bath subsequent to the dyeing operation. Various mixtures of

soap, olive oil and soda ash are employed. The method of procedure, for instance, when soap alone is used, is to treat the dyed goods for about 20 to 30 minutes at 200 degrees Fah. with a solution containing 2 to 3 pounds of soap per hundred gallons. The goods after the treatment are simply drained and not re-washed before drying. This leaves a certain small amount of the soap in the goods and this will tend to neutralize any acid which may subsequently be formed from the color.

Another very good procedure is to use a solution containing 2 per cent of soap and 1 per cent of olive oil, calculated on the weight of the goods. The temperature of this bath should be about 14 degrees Fah. The presence of the olive oil seems to be especially beneficial in enhancing the beauty and fullness of the color. It seems to increase considerably the apparent depth of the black color and also takes away from it the rather dead and rusty tone which many sulphur blacks develop after dyeing. In place of olive oil there may be substituted about twice the quantity of turkey red oil. It is doubtful, however, if this gives the same good results as far as beauty of tone is concerned as is the case with olive oil. Turkey red oil also frequently has the disadvantageous feature of giving a noticeable odor to the goods which, of course, is always objectionable. In place of soap, about one-half the quantity of soda ash may be employed for the purpose of properly emulsifying the oil, in which case it is well to boil up previously the mixture of soda ash and oil so as to obtain a homogeneous emulsion before these ingredients are added to the bath for treating cotton.

Another process which has for its purpose the enhancing of the tone of color, is to use a mixture of 1 per cent of starch and 1 per cent of lard boiled up together and added to the bath. I do not consider this amount as satisfactory a method of after-treatment as the soap and olive oil process. It may be noted in passing that where the soap treatment is given, it is necessary to use soft water, as otherwise a lime soap will be produced which will stay in the cotton and on drying give rise to a dusty greyish looking color, and instead of enhancing the beauty of the black its effect will be just the opposite. If soft water is not available for this purpose and it is absolutely necessary to use hard water, the soap should first be boiled up with the water containing a little soda ash and all scum or insoluble matter should be removed from the soap liquor before same is mixed with the oil and added to the after-treatment bath.

There have been other methods proposed for the after-treatment of black dyed cotton with a view of preventing the tendering effect of the sulphuric acid which may develop in the fibre. It has generally been found beneficial after dyeing with sulphur black, to give the dyed material a preliminary rinsing with a bath containing a small quantity of sodium sulphide. The idea of this procedure is that the sodium sulphide will dissolve out all the fixed particles of dyestuffs and also eliminate the free sulphur which may have been introduced from the dyestuffs during the dyeing operation.

Another method which has been put forward as very beneficial is to treat the dyed material first with a bath of tannic acid (or some suitable tannin compound such as sumack), and then with a bath containing milk of lime. The result of these two treatments is to precipitate in the fibre a tannate of lime which is insoluble and consequently is not removed by subsequent washing of the goods. If any free sulphuric acid is developed in the fibre after dyeing, it will immediately react with this tannate of lime and result in the formation of calcium sulphate which is inert and harmless, and tannic acid is set free which is also harmless in its effect on the cotton. This process we believe has been the subject of a patent. While it may be of considerable benefit in the treatment of piece goods which have been dyed black with sulphur colors and which are stored for a considerable time previous to their sale, it is doubtful if this method of treatment has any points of superiority when used on black dyed hosiery.

AFTER TREATMENT OF OTHER SULPHUR COLORS.

Many of the brown sulphur dyes seem to require an oxidization after they are dyed in order to fully develop the final color. No doubt such sulphur colors depend more or less on an oxidization for the formation of the true color lake, for it is noticed when these colors are dyed they gradually change on exposure to the air over a period of several days; or in fact, it may be several weeks. On this account it is very difficult to satisfactorily match colors which have been dyed with these sulphur browns, for if the match is made against a sample which has received its full development by exposure to the air, the newly dyed lot will gradually change and after awhile will not match with the sample. A variety of methods have been suggested to get away from this. Probably the most satisfactory is to employ an after-treatment of chrome, in which case from 1 to 2 per cent of potassium bichromate is employed, together with 3 to 5 per cent of acetic acid. Treatment is given in a boiling bath for about one-half hour.

In place of acetic acid 1 per cent of sulphuric acid may be used but this acid is not to be recommended owing to the possibility of tendering the goods in the boiling bath and also of the possibility of the acid inadvertently drying into the cotton. Frequently it is recommended to also use in conjunction with the chrome an equal quantity of copper sulphate. The idea in this addition seems to be to obtain an increased fastness to light. It is doubtful, however, if the use of copper sulphate has any material effect on the fastness of the sulphur color.

Some of the color manufacturers recommend the use of sodium acetate or sodium formate as an after-treatment for their brown sulphur dyes. In some cases this very materially aids in the development of the color and serves to stop any change in the tone of the color after dyeing, as it would also tend to prevent the subsequent tendering of the goods from the development of sulphuric acid. For certain of the sulphur browns an after-treatment with a cold bath containing 3 to 5 per cent of sulphate of zinc and 3 to 5 per cent of sodium acetate is recommended. Just what function the sulphate of zinc plays in this process is not described, and it is doubtful if it has any real use. The same effect would very likely be obtained by the use of the sodium acetate alone. As with the dyeing of sulphur blacks it is advisable to after-treat the brown sulphur dyeings with soap and olive oil or to give a preliminary rinsing in a bath containing a small quantity of sodium sulphide. The soap and oil treatment has the further effect of also giving the goods a softer handle. The method of dyeing the sulphur colors where considerable amounts of sodium sulphide and soda ash are always employed, causes the cotton to become rather hard in its feel. This defect is obviated in a great measure by the presence of the soap and oil in the fibre. The oil treatment also seems to yield to the color the richer appearance.

Some of the blue sulphur dyes, owing to their peculiar constitution, require a special method of after treatment, usually with the idea of effecting a mild degree of oxidization. One of the chief means of bringing this about is to steam the dyed goods in the presence of air. This develops the color and prevents subsequent bleeding of the color on washing. Another method of effecting this oxidation is to use a bath containing either hydrogen peroxide or sodium peroxide. In the former case the bath is prepared with 1 to 3 per cent of hydrogen peroxide solution, and the addition of a similar amount of ammonia. Where sodium peroxide is used, from 1 to 3 per cent of this substance is employed with the addition to the bath of a similar amount of sulphuric acid, or sufficient sulphuric acid to leave the bath in a slightly alkaline condition. The dyed cotton is treated with this cold peroxide bath for about 15 minutes when the bath is heated up to about 120 degrees Fah. and the treatment is continued for 20 minutes longer. After this the goods are rinsed and then treated with a hot soap solution. This treatment with the peroxide bath seems to develop fully the color and also stops any change in the color after dyeing. Care must be had, however, not to employ a peroxide bath at too great a strength, as otherwise the fastness of the color to washing will not be so good.

SOME QUESTIONS ABOUT KNIT GOODS.

BY MIDDLESEX.

EDITOR OF COTTON:

Will some of your readers kindly answer through your knit goods department or through your finishing department, the following questions:

(1). What is the cheapest and best method for treating cotton knit fabric that is to be cut into union suits?

(2). In what manner should it be handled to obtain uniform length?

(3). How can kier stains be removed so as to get an even shade with the surrounding fabric?

These questions, while comparatively simple, are some in which I am particularly interested, and in which I think many other of your readers would be interested. Methods for treating cotton knit goods vary in different parts of the country and I believe it would be to the advantage of every reader of these departments, if persons interested in knit goods manufacture or finishing in different sections of the United States or even in Europe, would write replies to these questions for publication in COTTON, giving an outline of the methods used in the section in which they reside. It is only by such interchange of ideas and suggestions, that manufacturers are able to progress. While one manufacturer succeeds in securing a satisfactory method for handling one section of his work, he may have an unsatisfactory method for some other section and in all probability, the very section with which he is having the difficulty, is the very section with which some other manufacturer, in some other section of the country, is working to a successful end, while he in his turn is having difficulty with the features which are proving of easy solution for the first manufacturer. It is to be hoped that we may succeed in securing adequate replies to these questions that will be satisfactory to your many readers.

VARIATION OF WEIGHT BY BLEACHING OR DYEING.

It may be generally taken for granted that the loss in weight of a good quality of cotton yarn through the ordinary bleaching operations is about 5 to 6 per cent, though short-stapled fibers containing motes and greasy impurities may lose as much as 8 to 9 per cent in weight, when the amount of moisture present in both is about the same. The amount of moisture found normally in raw cotton is from 7½ to 8½ per cent, and yarns hold quite as much when not too strongly dried or, on the other hand, when not damped. When light colors are dyed on bleached yarn the loss in weight occurring is due mostly to the bleaching, and as yarn for dark shades is mostly boiled first only with water, the loss in weight undergone is but 1 to 2 per cent; if the yarn is not boiled, but wetted-out simply by adding a soap or turkey-red oil to the dyebath, this loss is avoided; yet when strongly alkaline boiling dyebaths are employed, as in the case of the sulphide dyes, a loss of 4 to 5 per cent may be observed according to the duration of the dyeing operation.

It may also be generally accepted that the loss in weight experienced in the dyeing of cops is much the same as in the dyeing of hanks. It is notable, however, that some coloring matters tend appreciably to increase the weight of the cotton; these include indigo, the one-bath and oxidation aniline black, logwood black, cutch brown, and turkey red. Indeed, the increase in weight may in some instances reach 7 to 10 per cent. Some interesting experiments on this matter have been recently carried out. American cotton in 24's warp yarn was treated in portions, one bleached and the other dyed several typical colors, weighings being made before and after treatment only after hanging the yarn for a period of 24 hours in a room at a temperature of 30 degrees C. The normal weight of a bundle of the yarn was 4.54 kilos. Upon treating and again weighing after the prolonged drying, the following results were obtained:

	Weighed Kilos.	Showed a loss of
Bleached yarn	4.18	1.32 per cent
Sky-blue indigo yarn	4.52	0.44 per cent
Light-blue indigo yarn	4.52	0.44 per cent
Grey yarn boiled without soda	4.53	**0.22 per cent**
Medium blue indigo	4.53	0.22 per cent
		Gain.
Dark-blue indigo	4.60	1.32 per cent
Yellow (cotton yellow)	4.62	1.76 per cent
Alizarine pink	4.63	1.98 per cent
Methylene blue	4.68	3.08 per cent
New Victoria green	4.68	3.08 per cent
Slate (diphenyl black)	4.69	3.30 per cent
Dark blue (indigo topped with logwood)	4.75	4.62 per cent
Black (one-bath aniline black)	4.80	5.73 per cent
Yellow (chrome yellow)	4.80	5.73 per cent
Alizarine red	5.05	11.23 per cent
Orange (chrome orange)	5.25	15.64 per cent
Dark brown (catechu)	5.26	15.86 per cent

The small loss accounted for in the case of the bleached yarn may be due to the fact that it was treated by the centrifugal system. —*Textile Mercury.*

Practical Problems Discussed by Cotton's Readers.

We invite our readers to make use of this department for the discussion of any and all problems arising in the mill or the finishing plant. Questions, answers or letters need not conform to any particular style and will be properly edited before publishing. The editors do not hold themselves responsible for any statements of opinion or fact which may appear in this department unless so indorsed. This department is open to all.

SUPERHEATED STEAM IN TEXTILE MILLS

BY ROBERT H. WYLD.

The textile industries of the United States, considered as a whole, utilize an enormous amount of power, produced in a variety of ways, in the manufacture of their product. Probably no other industry has developed more highly the mechanical equipment of its plants, especially along the lines of special machinery for manufacturing processes.

The rapid growth in the use of steam for power purposes in the textile mills, due to the failure in many cases of a water power to furnish the amount needed for the growing demands of the mill, has brought up the consideration of all types of equipment that will show an economy of labor and fuel in the power plant.

With the growing demand for power economy, all classes of equipment for the economy of fuel are receiving great attention, and the use of superheated steam for decreasing the coal consumption of the mill has come into very general use.

At this point a concise statement as to the advantages derived from the use of superheated steam should be made. Superheating steam means raising its temperature above that due to its pressure without any change in the pressure. In a superheated state, steam becomes in every respect a gas, its volume is increased and it remains in a dry and gaseous state until all the superheat, or added heat, has been lost.

The advantages obtained from its use in this condition result in being able to carry it through steam lines and introduce it into engine cylinders in an absolutely dry condition, thus doing away with all condensation losses in the pipe lines and largely eliminating condensation in the engine cylinders.

By eliminating these losses a saving of steam approximately as follows is obtained. On the basis of 100 degrees superheat at the engine throttle, a triple expansion engine will show a steam saving of approximately 12 per cent; a compound engine a saving of 14 to 15 per cent and a simple engine a saving of 18 per cent or more. The use of superheated steam for steam turbines is now almost standard, due to the elimination of wear on turbine blading by its use and the increased capacities obtainable. The steam saving on the turbine is approximately 10 per cent for 100 degrees superheat.

Where engines are run non-condensing and the exhaust steam used for various mill purposes, such as drying, etc., the use of superheated steam in the engine has a very desirable effect for the exhaust steam in such cases is practically dry and free from moisture and in a condition to do the most effective work. Moisture in such processes is a disadvantage and dry steam just ready to break down and give up its latent heat is most effective for these purposes.

The advantage of having absolutely dry steam in all parts of the mill, with entire freedom from water troubles is an added inducement for the use of superheat. The lubrication of engines is made more certain and oil consumption reduced.

While the most modern mills are largely adopting the central power plant and the use of the electric drive, many of the older mills still find it necessary to send steam long distances and in such long lines the value of superheat is very great. The loss of pressure in such lines can be materially reduced, and drips from joints and stuffing boxes done away with.

In the design of new plants a large saving in the cost of steam piping can be made as superheated steam can be carried through the lines at much higher velocities than is possible with saturated steam since the friction of the gaseous superheated steam is much less. These increased velocities not only reduce the first cost of the piping, but also decrease the relative loss of heat and therefore add to the efficiency.

The use of superheated steam for special process work is also receiving increased attention and its use for drying, boiling dyes, etc., indicate that the time of these processes may be materially reduced or the output of existing equipment augmented by its application. These special uses are bound to receive increasing consideration, and apparently offer a wide field for future investigation.

Many of the best known mills are now using superheat and its application to the industry is rapidly increasing for any equipment that will pay for itself in from two to three years of operation and at the same time not increase the labor costs in the plant appeals strongly to the mill owners. Fuel costs in the majority of mills is apt to be high as the availability of low priced fuel is generally secondary to a nearby market for cheap raw material and a certain supply of skilled labor, thereby offering an added argument for the utilization of fuel saving apparatus.

MOISTURE IN COTTON.

BY J. A. W.

French spinners are, according to our Consul James E. Tunning, stationed at Harve, France, protesting vigorously because of the amount of moisture found in some cotton purchased in our South Atlantic states. Furthermore, they intend to establish a laboratory to determine the exact amount of moisture in order that they may make claims from us.

Just how the Frenchmen are going to start to find an average on which to compute the excess is an interesting and dignified question on which our cotton growers, ginners, sellers and exporters are going to have as much to say as the next one. And right well can they put their

case, arguing that the American custom of speed and rapidity, and the desire of early shipments on the part of foreign spinners must, on account of baling so soon after picking and ginning, result in more or less moisture in the bale. Also, as the season lengthens and especially if the crop be a large one, moisture is bound to pick up in the bales which are stored on wharves or out of doors awaiting shipment. An ocean voyage likewise adds dampness to a considerable extent. Therefore they, (the ones held responsible), do not intentionally sell water to anybody, and see no reason to make allowances.

Our French friends can truthfully respond that any moisture in a bale, however slight, at the time of baling, creates a permanent dampness, and is dangerous because of the chances of spontaneous combustion especially if closed hatches are used on account of rough weather when going across. Also it eats an awful hole in the next quarterly dividend to pay 14 to 16 cents per pound for water. Our bales should be so wrapped as to be nearly moisture proof when standing on uncovered wharves and places exposed to the weather.

Excuses galore may be offered from either side, but the salient fact is that our bale has the appearances of six car fares when placed beside of any other bale, and to remedy to a certain extent the moisture found by French spinners we must bale better. Not only to satisfy their demands must this be done, but to protect our own trade. Egypt, India, China, England and other countries are experimenting in growing the staple and doing remarkably well. Concerted action on the part of those who can influence our ginners to produce better bales is needed, not for their protection alone but for the entire cotton growing belt. Let us have it before it is too late!

THE MERITS OF AUCTION SALES.

BY T. Y. B.

Of all the various kinds of business conducted within the borders of this country, there is none that is so little understood and yet so readily condemned by people who are unacquainted with the facts relating thereto as the auction business, and the writer ventures to say that were he to approach almost any manufacturer in order to ascertain his views on the subject he would be waved away with the evidently sincere advice that under no consideration would he entertain any suggestion tending to urge him to consign his surplus stock to a reputable auction house to be sold at peremptory sale to the highest bidder.

In the eyes of the manufacturer the one making such a suggestion must be a fit subject for a lunatic asylum and all this in the face of the fact that this same manufacturer had stored in his warehouse at the time and was paying storage charges thereon, an immense stock of goods which were depreciating in value, (while the money invested was earning no interest), or else paying interest to some bank from whom a loan had been made against the merchandise, thereby increasing the cost of the goods the longer they were stored.

These are the facts in many instances and by following this method several mills have been forced to sacrifice goods at a great loss because they had been held in storage for as long as ten years and in some instances longer. Had these goods been offered through an auction house at a time when they were in demand, (for novelties are not always in demand), they would no doubt have realized close to 100 cents on the dollar, but by holding the goods, paying storage thereon, and adding interest to their value, is it any wonder that financial conditions arising compelled them to close out the goods at auction, when there was absolutely no demand for such merchandise, and on which they were lucky to realize 75 cents on the dollar.

Marshall Field, one of the greatest merchants this country ever produced, once said "The man who condemns or turns down any proposition without having first acquainted himself with all the details relating thereto confesses his ignorance and stupidity" and it was one of his rules never to refuse to inspect samples of merchandise no matter at what time they were submitted, and by adhering to this rule many of his best bargains were obtained.

The auction method of disposing of surplus stock is apparently condemned. Is it because of imaginative knowledge once spoken of by Marshall Field as ignorance? In England where the auction sales of wool, ostrich feathers, and other raw products attract merchants from all sections of the world, the auctioneer is held in higher esteem than any other merchant. It might be inferred that such a state of affairs does not exist in this country, but the writer speaking from a long experience can testify to the fact that there are auction houses in this country the members of which are men of the highest integrity and who possess ability second to none in the world.

These auction houses referred to never buy merchandise. If a manufacturer were to interview them with the object of selling them his surplus stock at thirty cents on the dollar they would not be interested in the least and would not purchase his goods at ten cents on the dollar notwithstanding the fact that the goods might be staple and would realize 100 cents on the dollar. They are auctioneers and as such could not conduct a straight business if they should purchase stocks, for the buyer would be bidding against the owner when such goods were offered for sale.

Would it not be more advantageous to the manufacturer to place his surplus stock in the hands of a reputable auction house where the sale of the merchandise, put up in lots to suit both the retail and wholesale trade, would be thoroughly advertised and sold on a long credit of four months? This does not mean that the manufacturer must wait four months for his money, on the contrary he receives payment in ten days from the date upon which the sale is held, less a commission for selling, which also covers discounting of sale and all other charges.

About two years ago a certain large house sent throughout the country samples of certain blankets of which one of their mills had about 5,000 cases, but the offers received were so low that the manufacturers refused to accept them although their representatives earnestly urged them to do so, at the same time insisting that they would never realize as much again, but the manufacturers were wise, they had sold goods at auction and knew from experience what they could expect. They held an auction sale and disposed of the goods inside of two hours at prices far in advance of any of the offers they had received when the samples had been submitted at private sale.

The sale of bed blankets and cotton goods valued at two million dollars made in 1908 by order of Amory Browne & Co. was another instance of successful merchandising where both the sellers and buyers were gratified with the

results. If the reader has ever attended during the past ten years any of the great auction sales of rugs and carpets made by order of Alexander Smith & Sons Carpet Co. of Yonkers, N. Y., he has become partly enlightened upon the auction problem. To see approximately five million dollars worth of merchandise disposed of to representative merchants throughout the country at prices which were gratifying to the sellers is something that should impress one.

MODERN METHODS.

Even to one whose business it is to note the changes as they come and go it is interesting to go back over the files of a commercial newspaper of 25 and 50 years ago and see what marked and progressive changes have taken place in methods of carrying on almost any line of business.

Take for instance the methods of selling property at public auction. In the old days no matter how important the sale might be the preparations were always the same and a small advertisement simply to cover the law and a red flag was all that was considered necessary for a successful sale.

How different is the modern way of preparing for and conducting these auctions. Today the prospective purchasers receive in many instances a descriptive catalogue giving them photographs of the property to be sold with detailed description of all lots, the exact location in the town or city and even the schedule of the train and electric car service, so that bidders shall waste as little time as possible in getting to and from the sale. In addition a lunch is often served at the expense of the auctioneer or the owners of the property, and these with the display advertisements in the trade papers are only a few of the up-to-date means employed in this branch of business, and the important point is that it has paid and paid well.

There are today thousands of men in this country who make a business of attending such sales and who cover all sections of the country in search of properties or material in which they specialize which may be offered at public auction, and many of them will also be found even in Europe and South American countries where the magnitude of the sale is sufficient to interest them.

One of the first to recognize the wisdom of these modern methods was a mill auctioneer of Lowell, Mass., and the results of his enterprise were so apparent that they have been adopted by all of the important auctioneers throughout the country. One result has been that while the year 1911 saw more big properties go under the hammer than possibly any previous year, prices obtained for them were remarkably high, and in many cases above the assessed valuation was obtained.

In manufacturing or in any line of mercantile business when a man is not meeting with the success reasonably to be expected, it may be due to the fact that he has clung too long to the old way and has not kept pace with his more enterprising competitor.—*The Commercial Bulletin*, of Boston.

"A NOTICE FOR BILL."

Will the correspondent from Fall River, Mass., signing himself "Bill," kindly forward his name and address to this office.—Editor.

MAKING A GOOD LAP.

BY H. C. M.

It is very necessary to make a good lap if you desire good carding. A good lap is one that will weigh the same at any part with a given length, and be free from foreign matter, and although that is not done in practice, it is the duty of the carder, (who is usually in charge of picking), to see that his laps are as near perfect as possible.

A lap should not vary more than ½ pound each way from the weight desired, and in order to know that they are weighing right, the carder should test a few laps each day. The inside of a picker should be cleaned, at least, twice a day, as they cannot be kept any too clean and rolls should be kept smooth. All parts should be kept well oiled and working free with a pliable, well pieced belt running near the center of the cones.

In setting the beater and grids for ordinary, one-inch American cotton, the distance between beater blade and feed rolls should be 3/16 to 5/16 of an inch. The grid bars should be set to beater ½ inch at least, while the distance between bars is usually about ½ inch from the edge of first three bars, while the rest are about ⅜ inch apart. The apron should be kept tight, so there will be no slip, and all gears set to the proper depth.

The air current is a very important consideration in making a good lap, for if it is too weak, too much waste and an uneven lap will be the result; while if it is too strong, the cotton will not be properly cleaned, and split laps will be the result.

HOW TO SECURE EFFICIENT SERVICE.

BY P. O. W.

One of the most important questions of the present day is that of mill help and the responsibility for securing the most efficient service falls almost solely on the overseer whose main duty it is to procure the best results from the operatives under his charge and thereby keep the machinery humming "Production."

The first step in this direction is to win the confidence of the employees and as a means to that end he should talk to them of their work, and during business hours he should confine his conversation with them solely to subjects relating to the work in hand. When, however, he is in the company of his helpers outside the mill he should be sociable in his manner, but at the same time avoid discussing any trivial or unimportant matters with them. An overseer should be careful in his manner to employees in order that they may always understand that he is firm and business like in all his dealings. Then, too, when he gives them instructions regarding any part of the work they must be made to understand that he means exactly what he says. Employees will soon learn to appreciate this, and nine times out of ten they will not need to be reminded of any instruction a second time.

I do not think an overseer should exact any service of his help which he would not willingly perform himself, if the occasion required it, for an arbitrary and unreasonable command from an overseer to his helper might be met with similar conditions from his helper to himself.

I hope to see this in print in COTTON and would be glad to hear from some one else about the "help question."

NEW MACHINERY AND TRADE NOTES.

A BATTERY TRUCK CRANE.

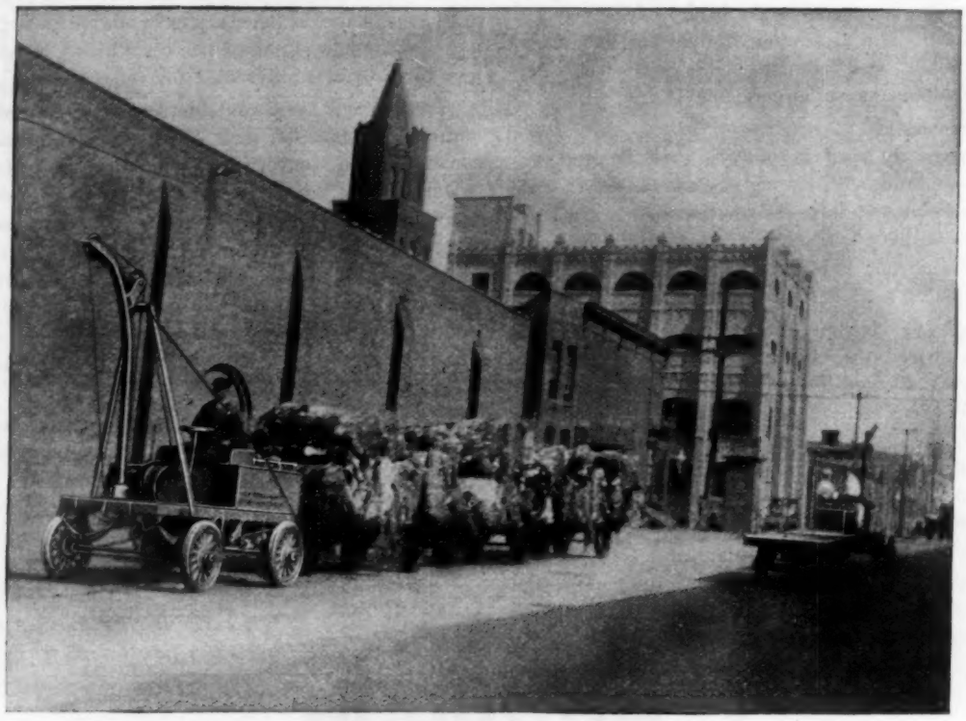
A device for handling bales, cases, etc., with expedition and at a low cost, when such materials have to be lifted and moved through moderate distances, has been urgently needed, not only at the great railway and marine terminals, but also in manufacturing plants and many other places. To meet this demand the General Electric Company, Schenectady, N. Y., is placing on the market an electric vehicle which has a swinging crane mounted on the front end, The crane's hook is raised and lowered by a one-ton hoist mounted on the front end just back of the crane, the motors driving the hoist and the vehicle being operated from a battery mounted on the rear end. The time saving applications of this crane may be classed under three heads, hoisting and carrying on the hook, and towing trailers, yet a given movement of material may involve one, two or all of these.

In a case where such materials has to be deposited within a 6 or 8 foot radius and this action does not require that the parcel be moved through a vertical distance of over 10 feet, the machine is brought into an advantageous position, the brakes are set, and the vehicle remains stationary as the boom of the crane moves back and forth between the picking up and depositing points and may thus be employed to load or unload box cars, gondola cars, wagons, power trucks, trailers, lighters, etc., and effects saving both in time required and number of men employed.

The following represents an average week's work at towing trailers in the Bush Terminal, New York, deduced from the logs of a number of these machines operating over a long period:

Number of packages handled	7,570
Average weight per package in pounds	230
Total weight handled (900 tons) in pounds	1,720,000
Average distance packages were moved in feet	900
Per cent. of total time machine was working	80
Packages delivered per working minute	3
Number of different jobs worked on	30
Heaviest single load drawn in tons	12½
Cost of operator, interest, depreciation, power	$24.00
Cost of moving one package 900 feet in cents	⅓
Cost of moving one ton (9 packages) 900 feet in cents	.03

Six hundred thousand pounds of cotton have been moved one-half mile in a day (10 hours), taking 24 bales per load and making a round trip every 12 minutes. This gives an average of two bales (500 pounds each) per minute moved a distance of one-half mile. On a hurry order for cotton, 48 bales (12 tons) were delivered alongside the lighter within 25 minutes after the order was given. One battery truck crane using three trailer trains of two cars each, has moved 1,000,000 pounds of small package freight (canned salmon) 600 feet in nineteen hours.



BATTERY TRUCK CRANE GOING TO CARLOADING PLATFORM.

The February issue of the *Cortright Metal Shingle Advocate* has just arrived. This little magazine is issued by the Cortright Metal Roofing Company, 50 N. 23d St., Philadelphia, and is brim full of information for those intending to build or remodel their buildings. It has a circulation of 35,000 each month, all sent free, the only qualification necessary for you to receive it regularly each month is to write the Cortright Company stating that you are interested in knowing more about roofing and building problems and they will be glad to add your name to the list—do it now before you forget it.

WHAT ARE CORK INSERTS?

Cork is the bark of a tree, known as the cork oak, and is the lightest known solid. It has a very high co-efficient of friction and when inserted in sockets under high compression is not affected by many of the conditions which seriously impair the efficiency of other substances used for friction surfaces. It possesses a quality not found in any other solid; namely, that of altering its volume to a marked degree under pressure, being compressible and resilient.

Cork is made up principally of an aggregation of minute air cells, having thin, air-tight, water-tight and very strong walls. If compressed, the resistance to compression continually grows stronger, in a manner more like the resistance of a gas under compression than that of an elastic solid, such as a spring.

Power is largely transmitted by means of pulleys driven by belts, and the capacity of a belt of given dimensions is often greater than the capacity of the pulleys over which it runs; therefore, pulleys having high frictional efficiency are most desirable. The loss that occurs from the slipping of belts means waste, and in some cases a defective product.

To eliminate these difficulties, pulleys are lagged, belts are run under excessive tension to the injury of the belt and with an increase in journal friction far beyond economical operating conditions, and belt dressing is used—sometimes in quantities that means an appreciable yearly charge to expense account.

If cork inserts are used in pulleys, such lagging, excessive belt tension and belt dressing are unnecessary. Pulleys and friction clutches, from the smallest size to the largest, thus equipped, have a friction surface with a high co-efficient of friction, long life and uniformity of action under all conditions of temperature, oil, moisture, etc.

Two methods of construction are used: In one the sockets are so spaced that the corks occupy a relatively large area and are allowed to protrude above the surrounding surface 1/16 of an inch or more, so that they alone come in contact with the opposing surface and transmit all the power. This drive is most efficient where power is transmitted by means of a large area of cork used at light pressure, as is customary on the frictions of looms and similar machinery and in certain types of plate and multiple disc automobile clutches. Many thousands of automobile and loom clutches thus fitted have been in constant operation for years without requiring repairs.

In the other method of construction the corks are allowed to protrude above the surface of the material in which they are embedded but 1/32 of an inch, as in the case of pulleys, automobile clutches, street railway brake-shoes, etc. This method gives an almost indestructible combination surface, of high frictional efficiency and great wearing qualities. At low and medium pressures the corks, with a co-efficient of friction of say 0.35, work alone; while at high pressures the inserts are compressed into their sockets, and the surrounding metal, wood or fiber also comes into engagement to supplement and protect the corks.

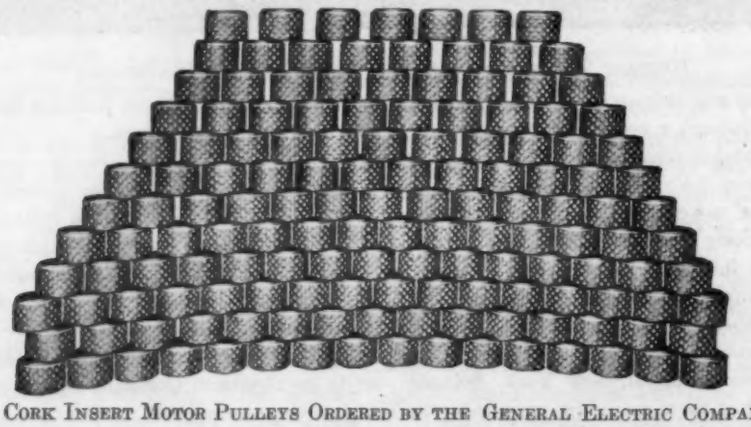
That cork inserts used in this manner will withstand heavy loads, constant abuse and excessive heat, is shown by their present use in more than 100,000 motor car clutches. Booklet giving full particulars of tests sent on request by The Cork Insert Company, 16 State St., Boston, Mass.

SOME INTERESTING LOOM FACTS.

The January number of *Cotton Chats*, the little monthly booklet issued by Draper Co., Hopedale, Mass., has been received. We note that an interesting change nas been made in this magazine, in that they have adopted a slightly smaller page. It is now standard size 6 x 9 inches and in a convenient form to be readily filed for reference.

The current issue contains some very interesting information in connection with Northrup looms, inasmuch as it shows the total number in the United States, including orders to January 1st, 1912 to be 219,752. It is interesting also to note that of this large number of Northrup looms in use, 122,262 are located within the borders of the sixteen Southern States. This amounts to 24,772 more Northrup looms than are utilized in all the balance of the country. The South is now speaking for itself and speaking in tones emphatic enough to be distinctly heard and understood by every keen business man.

Another interesting comparison in regard to the Northrup loom is that of the 685,000 looms at present in use in the whole United States, 219,752 or practically 33 per cent. of these looms are Northrup looms. During 1909 and 1910 the Draper Company shipped 45,244 Northrup looms and in 1911 they shipped 21,015 Northrup looms. The wide spread popularity of this loom is perhaps more strongly shown by these figures than by any other argument that could be advanced.



Part of the Cork Insert Motor Pulleys Ordered by the General Electric Company for the Group Spinning Frame Drives of the Pilgrim Mills, Fall River, Mass.

C. E. RILEY, Pres.
Boston Office
65 Franklin Street

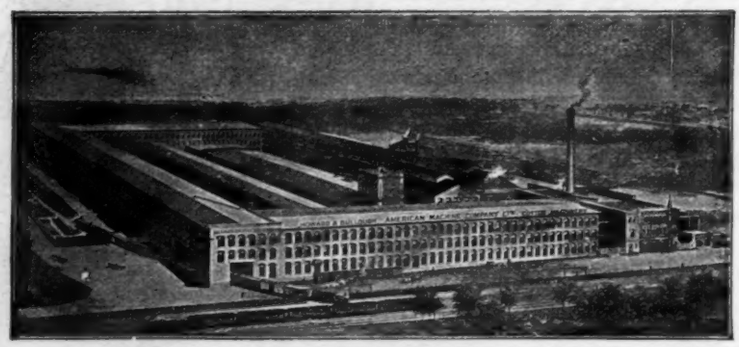
Southern Offices
814-815 Empire Bldg.,
Atlanta, Ga.

H. & B. AMERICAN MACHINE COMPANY

PAWTUCKET, R. I.

COTTON MACHINERY

Are You Interested to know what is the best?



Send for our Descriptive Circulars with lists of users

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Intermediate and Roving
Frames

Improved Spinning Frames
Twisters
Cone Winders
Warpers and Slashers

WE INVITE YOUR INVESTIGATION AND COMPARISON

VAT COLORS.

Reviewing the work of the last few years in the coal tar industry, one cannot suppress the impression that the development of vat dyestuffs has made wonderful progress. It would seem superfluous to again call attention to the great result which the Indigo synthesis has achieved; that today the natural product has been almost entirely replaced with Indigo artificially produced. Yet, this was only the beginning, as Indigo remained, as before, the only vat color, and until recent date had but one representation, Indigo blue, which played a very isolated role, not only in dyeing but also in scientific chemistry. At the present time we have knowledge not only of a number of vat dyestuffs which behave similar to Indigo, but also combinations of a very different composition which can be dyed by vat processes.

In the last few years two ways have been tried of solving the problem of producing vat colors of different shades, one in the direction of Anthraquinone (Indanthrene and Algols), the other and newer territory is that of the Thio Indigoes (Kalle & Co., Inc.), which is of recent date and have been productive of valuable results. Inasmuch as Anthraquinones (Indanthrene and Algols) dye exclusively cotton, the Thio Indigo group, on the contrary, are true vat dyestuffs, which, like Indigo, are suitable in a like degree for dyeing animal as well as vegetable fibre, silk, wool, artificial silk, etc. Therefore, the specific complaint, "want of fastness," of the artificial dyestuffs, made in the early stages of the coal tar industry, has lost its justification in the employment of Thio Indigo colors for both cotton, wool and silk, not only for dyeing but for printing.

The firm of Kalle & Co., Inc., has within the last few years brought out and placed upon the market a line of excellent Thio Indigo vat colors, especially distinguished by their fastness to light, chlorine and washing, viz:

Orange R Paste Pat.	Rose A N Paste Pat.
Brown G Paste Pat.	Rose B N Paste Pat.
Brown 2 R Paste Pat.	Green G Paste Pat.
Brown 5 R Paste Pat.	Violet B Paste Pat.
Scarlet S Paste Pat.	Violet 2 B Paste Pat.
Scarlet G Paste Pat.	Violet 2 R Paste Pat.
Scarlet R Paste Pat.	Violet K Paste Pat.
Red B Paste Pat.	Grey 2 B Paste Pat.
Red 3 B Paste Pat.	Scarlet Salt 2 G Paste Pat.
Red B G Paste Pat.	Indigo K G Paste Pat. and
Yellow Paste Pat.	Blue 3 G N Paste Pat.

Thio Indigo Red B Paste Pat. especially found approbation, not only as a self color, but is often used in combination with Indigo when reddish shades of Indigo blue are required in the manufacture of government or officer blues. This refers in particular to the woolen manufacturers. Whereas, when formerly they were compelled to produce so-called reddish shades of Indigo blue, the wool was previously mordanted and then dyed with Alzarine Red, and subsequently colored blue by vat process with Indigo, the same results can now be obtained by combining Thio Indigo Red B with Indigo itself, performing the whole dyeing operation by one process where Hydrosulphite vats are employed; thereby lessening not only the cost and protracted grounding with Alizarine Red, but giving the manufacturer his wool in such an improved condition that he not only can spin finer, stronger and better yarns, but also save considerable waste in the process of manufacture. It has also an advantage inasmuch as it can be dyed in a vat of Sul-

phide of Sodium reduction, and in like manner in combination with any group of so-called sulphur colors.

The Thio Indigo Scarlets produce most beautiful shades of splendid fastness (both when printed and dyed) to all color destroying influences, as does also the browns, yellow, orange, green, etc.

For Thio Indigo violets and rose, it is claimed that they produce the fastest violet, heliotrope and pink shades on the market, and can be employed for dyeing or printing animal and vegetable matter.

As already mentioned in the introduction, Thio Indigoes and their derivatives represent fast vat dye-stuffs, and the analgy with indigo, which we find in the chemical structure, is also found in the technical use of the products, and are suitable for all textures of vegetable and animal origin. The dyeings and prints are always of the very best fastness, and the fast dyeings of silk, artificial silk, also both wool and cotton, will be taken up more and more by constant demand of the requirements of trade. The dyeing itself is the same as with Indigo, because all means of reduction which serve for the preparation of the Indigo vat may also be used for these dyes. Practically, however, the method confines itself almost exclusively to Hydrosulphite vat process, which is the most modern of all methods of present day indigo dyeing, and not without reason, inasmuch as by this process the bothersome contamination occasioned by the use of so-called "fermentation" vats is eliminated. Yet, as before stated, Thio Indigoes and a few of their derivatives have the advantage of producing practical vats by the use of sulphide of Sodium reduction.

For printing also, the above mentioned dyes are most suitable in a pre-eminent degree. The printing paste is made by means of soda lye or caustic, hydrosulphite industrial gum, wheat starch and water. A white discharge of Thio Indigo printed fabric is obtained by use of hydrosulphite. Therefore, considering the sum of all the fastness properties of these colors, it can well be claimed that they will be called upon to play a most superior role in the future in every territory of the textile industry.

WASTE.

No doubt you are a manufacturer of cotton fabrics and a successful one. You are possibly paying your stockholders dividends each year. Could you not pay them larger divisions if you did not sustain such a loss on account of the waste in your plant? This is the leak that sinks the big ship.

While investigating the cause of so much waste in other departments do not overlook your weave room and the large amount of waste caused from shedding. This is a serious matter and should be attended to without delay. Do you know the best means of stopping this evil? You will find by using a binder in your size together with either tallow or soluable tallow, your waste will be reduced wonderfully. The best manufacturers today find by using a binder in the form of a soluble gum together with tallow or some other softening agent, they obtain the best and most economical results. The ARABOL MFG. CO., of 100 William Street, New York City, are furnishing a large per cent. of their customers, especially through the South, their Yorkshire Gum, and they find it is much superior to the ordinary sizing compounds.

WINDING SPLICING YARNS.

The UNIVERSAL WINDING COMPANY has recently perfected an attachment to the No. 90 filling winder for building a small bottle bobbin 2⅜ inches in diameter by 9½ inches long. A bobbin of this size as shown in the illustration contains about one-half pound of yarn and meets a requirement of the knitting trade particularly for holding fine splicing yarns.

THE NEW BOTTLE BOBBIN.

The chief feature of this adaptation of the filling wind making it of service to the knitter is the crossing of the yarn several times between the top and bottom of each layer, thus equalizing the ballooning and preventing the yarn from clinging to the spindle as the bobbin becomes nearly empty. Other features of the No. 90 filling winder tending to long life and small repair expense are the high quality of the material used in its construction, the mechanical perfection of its machining and assembling and the self-oiling arrangement.

BOOK REVIEWS.

EFFICIENCY AS A BASIS FOR OPERATION AND WAGES, by Harrington Emerson. Third edition revised and enlarged. 254 pages. Price, $2.00. Published by the Engineering Magazine, 142 Nassau Street, New York City.

This volume is another one in the well known works management library of the Engineering Magazine. By works management, is meant the process of directing the great forces of manufacturing to the best advantage in economy. This subject has been studied and discussed very considerably during the past few years and has progressed from the condition of a scarcely formulated practice to that of a rapidly materializing science. These discussions have been notably stimulated at certain points by the publication of the work of great investigators or practitioners in the field. F. A. Halsey's promulgation of the premium plan and H. L. Gantt's development of the bonus system, and the use of schedules and instruction cards mark epochs

Barrett Specification Roofs

Warner Bros. Co., Corset M'f'rs
Bridgeport, Conn.
Day & Zimmerman, Engineers,
Philadelphia, Pa.

Best For Apartment Houses

THE "COLONADE" apartments in Kansas City, Mo., illustrated herewith, have Barrett Specification Roofs.

The owners selected this kind of roofing because they wanted first of all the least expensive roof which would give **proper protection.**

As a Barrett Specification Roof will last 20 years and over without care or attention and as its cost is less than that of any other permanent roof covering, they made no mistake on that point.

The owners wanted **low annual charges**, and Barrett Specification Roofs were satisfactory in that respect as they require no painting or care.

The owners also wanted proper **protection against fire** and as these roofs are considered by fire underwriters as slow burning construction and as such take the base rate of insurance, everything was satisfactory on that point.

It's always the same story—when ultimate costs and satisfactory service are carefully considered, Barrett Specification Roofs are selected.

Further information about Barrett Specification Roofs will be supplied free on request.

BARRETT MANUFACTURING COMPANY,

New York, Chicago, Philadelphia, Boston, St. Louis, Cleveland, Pittsburgh, Cincinnati, Kansas City, Minneapolis, New Orleans, Seattle, London, Eng.
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SPECIAL NOTE

We advise incorporating in plans the full wording of The Barrett Specification, in order to avoid any misunderstanding.

If any abbreviated form is desired however the following is suggested:

ROOFING—Shall be a Barrett Specification Roof laid as directed in printed Specification, revised August 15, 1911, using the materials specified, and subject to the inspection requirement.

TRADE B MARK

in the growth of the newly applied science. A great impetus was given by H. S. L. Oreutt's papers on machine shop management which appeared in The Engineering Magazine in 1899 and a new phase was inaugurated by Mr. Carpenter's two series on profit making management. Later F. W. Taylor gave his treatise on shop management before the American Society of Mechanical Engineers. This was followed by Mr. Emerson's development of the efficiency system, which has taken its place as one of the classics in the literature of industrial engineering. The chapter headings are as follows: Typical Inefficiencies and Their Significance; National Efficiencies, Their Tendencies and Influence; The Strength and Weakness of Existing Systems of Organization; Line and Staff Organization in Industrial Concerns; Standards, Their Relation to Organization and to Results; The Realization of Standards in Practice; The modern Theory of Cost Accounting; The Location and Elimination of Waste; The Efficiency System in Operation; Standard Times and Bonus; What the Efficiency System May Accomplish and The Gospel of Efficiency.

TWELVE PRINCIPLES OF EFFICIENCY, by Harrington Emerson. 423 pages. Price, $2.00. Published by The Engineering Magazine, 142 Nassau Street, New York City.

This book is practically a sequel to his first book on "Efficiency as a Basis for Operation and Wages." In the first volume Mr. Emerson traced the elements of a philosophy. In this second work he reduces these to definite and clearly defined principles. The principles are so universal that they may be used to test the efficiency of an existing organization, or they may be made to serve as guides in directing the conduct of further enterprises. In this volume, the author defines twelve principles by which efficiency is determined. Five of these concern relations between men, or in the industrial problem, between employer and employee. Seven of them concern methods or institutions and systems established in the manufacturing plant or in the operating and distributing company. The method of treatment is simple and logical. An introductory chapter lays down the premise that the prime institution for the attainment of efficiency are not men, materials, money, machines, methods, but theories of organization and principles, and that inefficiency prevails because the type of organization in general use does lend itself to application of efficiency principles. The second chapter discusses the type of organization, under which efficiency principles can be successfully applied. The twelve following chapters take up each one, a single principle as follows: Ideals; Common Sense and Judgment; Competent Council; Discipline; The Fair Deal; Reliable, Immediate, and Accurate Records; Planing and Dispatching; Standards and Schedule; Standardized Conditions; Standardized Operations; Written Standard Practice Instructions; and Efficiency Reward. Two concluding chapters are applied as a means of diagnosis of industrial conditions and as a correction of existing inefficiency. To the man in charge of the active management of any factory, these books contain a mine of information and are well worth many times their price.

CLARK'S DIRECTORY OF SOUTHERN COTTON MILLS. Edition of January 1, 1912. 138 pages and pocket size. Published by the Clark Publishing Co., Charlotte, N. C. Price, $1.00.

This directory was compiled by David Clark, editor of the Southern Textile Bulletin and it contains data relative to the Southern mills which will be of great value to any one looking for details of this character. This book gives the number of spindles and looms of each mill. The officers and buyers and capital stock. Mills operating dye houses are also noted and the kind of power used in the operation of the machinery, whether steam, water, or electricity. The railroads on which each town is located is also given, which makes it convenient for a person desiring to know which road to take to reach any desired destination. The book is very convenient and complete and Mr. Clark is to be congratulated on compiling so useful and handy a volume.

THE CITY OF THE DINNER PAIL, by Jonathan Thayer Lincoln. 186 pages. Price, $1.25 net. Published by Houghton-Mifflin Co., 4 Park St., Boston, Mass.

Last month we called attention to a book entitled "The Factory" by this same author, and while this present book was published some two years ago, still for those who have read his book entitled "The Factory" and have not read "The City of the Dinner Pail," they will at once be anxious to also look over Mr. Lincoln's previous work. It is really a study of the city of Fall River, and is compiled from articles which first appeared in the *Atlantic Monthly* and in *The Outlook*, and was later published in book form by permission of the publishers of these magazines. The chapter headings are called The City of the Dinner Pail; The Average Citizen and the Labor Problem; The Man and the Machine; The Time Clock; Trade Unionism and the Individual Worker; and The City of Luxury. This last chapter is a glimpse of Newport, R. I., which closely adjoins Fall River. "As you approach the city of the dinner pail from the west, the blue waters of the harbor lie between you and the towering factories which line the opposite shore. By day the factories are not attractive to the eye, their massive granite walls, prison like and unlovely, suggests only the sordid side of toil. But should you thus approach the city late on a winter afternoon, the scene is marvelously changed. The myriad lights of the factories shine through the early darkness, transforming prison walls into fairy palaces. There is no suggestion of sordid toil, the factory walls have become ramparts of light, and speak of some romantic story."

PERSONAL.

I. G. Hetherington, of John Hetherington & Sons Ltd., Manchester, England, was a welcome caller at the New York office of COTTON recently. He has been in this country about a month. He sailed for England on February 7th. It was his intention to visit the South, but imperitive business calls prevented his doing so on this occasion.

Crompton & Knowles Loom Works, at the recent annual meeting reelected the old board of officers except Arthur K. Hutchins, who resigned as clerk and was succeeded by E. E. Howard. C. H. Hutchins is president, L. J. Knowles, vice-president and treasurer; George F. Hutchins, general superintendent, and Charles M. Thayer, solicitor.

The Kinkead Apparatus for aligning and leveling shafting has just been installed in the plants of the Royal Cotton Mills, Wake Forest, N. C., and the Minneola Manufacturing Company of Gibsonville, N. C.